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EIGHTH BIENNIAL REPORT

MAY 26 1892

STATE BOARD OF HEALTH

OF

P-2638

CALIFORNIA,

FOR THE YEARS OF 1882 AND 1883.

SACRAMENTO:
STATE OFFICE . . . . . JAMES J. AYERS, SUPT. STATE PRINTING.
1884.

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Leland Stanford, Jr.
UNIVERSITY

MEMBERS OF THE STATE BOARD OF HEALTH.

HENRY GIBBONS, Sr., M.D., President ..... San Francisco
H. S. ORME, M.D. ..... Los Angeles
J. M. BRICELAND, M.D. ..... Shasta
W. R. CLUNESS, M.D. ..... Sacramento
H. C. CROWDER, M.D. ..... Williams
CHESTER ROWELL, M.D. ..... Fresno
F. W. HATCH, Sr., M.D. ..... Sacramento

REGULAR MEETINGS—At Sacramento quarterly, on the third Friday of the month.
SPECIAL MEETINGS—At the call of the President.

COMMITTEES OF THE STATE BOARD OF HEALTH.

1. On the Salubrity of Public Institutions, Schools, Hospitals, Prisons, Factories, etc.:

DRS. BRICELAND, ORME, AND GIBBONS.

2. On Statistics Relating to Life and Health, Modes of Employment and of Living, and the Comparative Healthfulness of Different Localities:

DRS. CLUNESS, ROWELL, AND CROWDER.

3. On Intoxicating Liquors, Inebriate Asylums, Pathological Influence of Alcohol, etc.:

DRS. GIBBONS, CLUNESS, AND HATCH.

4. On Influence of Irrigation, Tree Planting, etc.:

DRS. ORME, ROWELL, AND CROWDER.

5. On Legislative Business:

DRS. HATCH AND CLUNESS.

Of these committees the Secretary of the Board is *ex officio* a member.

123417

REPORT

OF THE

STATE BOARD OF HEALTH.

REPORT OF THE BOARD.

To his Excellency GEORGE STONEMAN, *Governor of the State of California:*

The State Board of Health respectfully present for your consideration, and that of the Legislature, their eighth annual report.

Although several subjects of special interest, and which as such, are at the present time occupying the attention of sanitarians, have been compelled, in consequence of sickness of the Secretary of this Board, to be omitted, it is hoped that the general interest and practical usefulness of this report, as compared with others of the series, will be found to be fully sustained by the valuable contributions contained in the supplement. The subjects they contain are of a practical character, and thus serve to fulfill one of the most important purposes of a State Board of Health, to wit: the dissemination of useful information among the people. We desire, especially, to direct your attention, and through you that of the Legislature, to several subjects urgently referred to by the Permanent Secretary in his report to this Board. One of these, the procurement of a quarantine station in the harbor of San Francisco, we have abundant evidence to know, commands your warmest sympathy, and in view of the deep interest you have taken in the subject, it is scarcely necessary to do more than allude to it in this place. The State Board of Health regard this subject as one of the very first importance. With epidemic contagious disease already knocking at our doors, and in view of the reasonable expectations for the future, it is due to the credit of the State, and an intelligent appreciation of the real purpose of legislation, that decisive action should be taken upon this subject at the present session.

Another subject, the necessity of which the experience of the past two years has amply demonstrated, is the appropriation of a moderate sum for the purpose of preventing the introduction of infectious and contagious diseases into the State by inland communication. The history of the efforts of the Board in this direction, and the difficulties under which they have labored, if fully and graphically related, would form the subject of an interesting review. Commencing in the Winter of 1880, without any means whatever appropriable for the purpose, we succeeded, it is believed, by a somewhat rigid quarantine, in excluding smallpox from the State by inland communication. Nearly two years ago the Legislature, recognizing the importance of the subject, appropriated a special fund of $500 to aid in the protection of the State by quarantine inspection. The subsequent appearance of yellow fever in the State of Sonora and other parts of Mexico in 1883, and again during the present year, 1884, and the probable recurrence of the disease in Mexico for some years to come, will demand the utmost vigilance on the part of the Board of Health. Then again,

[illegible] rapid in its progress. [illegible] from Europe, and this year [illegible] and the liberal expenditure [illegible] our State, or, failing in this, [illegible] recommended, therefore, that the Legislature grant the petition of asking a contingent appropriation [illegible] by the Board of Health. [illegible] approval of the Board of Education, for the necessary purposes of the State, and for this purpose [illegible]

[illegible] commended to your consideration [illegible] to be vaccinated previous to admission [illegible] This policy has been tried in other States with the [illegible] of this State, and the utility and practicability [illegible] We respectfully refer you to the remarks of the Secretary upon this subject in his report to this Board.

Respectfully recommended by the Board.

F. W. HATCH, M.D.

STATEMENT

Of the condition of the appropriations for mileage and contingent expenses of the State Board of Health, for the thirty-fourth and thirty-fifth fiscal years:

Mileage and Expenses of the State Board of Health, Thirty-fourth Fiscal Year.

Appropriation, May 12, 1881	$1,296 92	[illegible] expended	$1,034 32
Unexpended balance, thirty-fifth fiscal year	44 92	[illegible] unexpended	262 60
Total	$1,296 92	Total	$1,296 92

Mileage and Expenses, State Board of Health, Thirty-fifth Fiscal Year.

Appropriation, March 9, 1882	$1,250 00	Amount expended	$1,032 07
		Unexpended balance	217 93
Total	$1,250 00	Total	$1,250 00

To prevent the Introduction of Infectious and Contagious Diseases, Thirty-fifth Fiscal Year.

Appropriation	$500 00	Amount expended	$155 15
		Unexpended balance	344 85
Total	$500 00	Total	$500 00

REPORT OF THE PERMANENT SECRETARY

TO THE

STATE BOARD OF HEALTH.

REPORT OF THE PERMANENT SECRETARY.

REVIEW OF 1882.

To the State Board of Health:

The sanitary history of 1882 was marked by the occurrence of several minor outbreaks of epidemic contagious disease, none of them, however, of sufficient magnitude to occasion general, or even much local uneasiness. In the monthly bulletin (January, 1882), of the Board of Health, we find nine deaths reported by smallpox at San Francisco, one in Los Angeles, and four cases not fatal at Los Gatos, in Santa Clara County. The latter occurred among immigrants from one of the Western States by Central Pacific Railroad. Dr. Fox, also, reports one case of varioloid, in the person of a negro tramp, at Riverside, in San Bernardino County. Prompt attention seems, however, to have prevented any spread of the disease in either instance.

The same bulletin reports the epidemic prevalence of scarlatina in Grass Valley and in Vallejo. In the latter city seven deaths occurred from this cause. Dr. James Frost, of Vallejo, writes, under date of February second, that "during the past ten weeks scarlatina has been epidemic here, and mostly of malignant type." During January there were seven death from this disease, and the physician's certificate, in each case, reports it as *malignant.* The same disease has been somewhat prevalent in Woodland, but it is said to have now almost entirely disappeared. Two cases of smallpox were reported in June in Oroville, Butte County, and within a few days after two additional cases at Camptonville, Yuba County. But one death. A single case occurred also at Germantown, Colusa County. Particulars of these cases could not be learned. Again, smallpox was reported at Red Bluff in December of this year. The subject of the disease is stated by Dr. Westlake, of Red Bluff, to have been a prisoner from El Paso, Texas. He was placed, by the Deputy Sheriff having him in charge, in the jail, and remained over night, four other inmates being confined there. "The next morning," the doctor says, "as soon as it was ascertained that he had smallpox, he and the other prisoners were removed to the pest-house. From this case we had two cases of the confluent form, and three cases of varioloid. But one of the number proved fatal. The prisoner with smallpox was brought directly here from Black's Station on the passenger train, and the eruption was fully developed when he arrived here. It is probable that a hundred and fifty persons were exposed to the contagion in transit, and I believe no one was injured along the route."

REVIEW OF 1883.

The year 1883 presents several features of interest. It will have been observed by the reader that several minor outbreaks of smallpox occurred during the previous year. These appear to have been prolonged into 1883. The earliest record of mortality by smallpox this year in possession of the Board of Health was about the middle of March, at Nevada City. The first case was reported on the fourteenth of the month, originating in the family keeping the City Brewery, this being a favorite resort. Further than this the origin of the disease is unknown. Prompt measures were immediately taken to prevent the spread of the disease among the citizens. Dr. Welch was chosen Health Officer by the Board of Supervisors, with almost unlimited powers, and the City Marshal requested to enforce his orders. Every case of disease occurring was isolated and the house guarded, while a general sanitation of the city was directed. Vaccination was at the same time vigorously applied. From the fourteenth to the twentieth twenty-one cases of the disease were reported, eighteen of which were verified. Of the number three died. At the same time, extending into April, Napa City was invaded by smallpox, three deaths from that disease occurring in March. I visited the locality, and ascertained that the most stringent measures had been adopted by the Board of Health. Schools were closed and general vaccination urged. The city was also placed in good sanitary condition. The disease is thought to have originated in a Spanish dance-house, and considering the number exposed, it is somewhat surprising that a greater number did not fall victims thereto. The exact number of cases and deaths I have no official record of.

In April, 1883, Dr. Rooney informs us, a severe case of diphtheria occurred at Auburn, directly traceable to bad drainage. "The case was a very severe one, but is making a good recovery. I also have had five cases of the same disease in one family in an adjoining town, one of whom died; and these, also, were unquestionably due to bad drainage and a low damp situation."

The latter part of this month (April) information reached this office of the existence of smallpox in Visalia, creating considerable excitement in consequence of a difference of opinion as to the nature of the disease. In answer to a communication upon the subject, Dr. A. E. Hall writes as follows:

> There were six cases of smallpox in Visalia, all in one family; three of them were vaccinated, and consequently had varioloid, and three that were not vaccinated having the confluent form. All recovered but one, a child not quite three years old. Another family, twelve miles southwest of this town, had, some time prior, eight cases, three slight and five severe, with one death—a child about three years old—treated by Dr. ———, and called swinepox. The doctor and his friends concluded that I had made a mistake in diagnosis, and sent for Dr. Meares to come and prove it, which occasioned all the excitement and exaggerated reports that such a case would necessarily produce in a country place like this.
>
> The Board of Health and Dr. Meares visited the family in the country, and found that three of them had had varioloid and five confluent smallpox in various forms, and all had been up and about for some time. The first one in the family in town was taken on March twelfth, and the last one has almost disquamatated sufficiently to fumigate the house, without any new cases having appeared. I am satisfied that the disease first made its appearance in the extreme southern part of the county, as I heard of several families some months since who had an eruptive disease that they called chickenpox, but from the history am satisfied was smallpox, and upon inquiry find the head of the family southwest of town was in the southern part of the county just two weeks before he was taken sick. It is very rem[illegible]re has been no more cases, and think climate must have something to do wit[illegible]
>
> I am, respectfully, E. HALL.

About the first of July the following newspaper slip appeared, which from the occurrence of the incident mentioned, simultaneously with an outbreak of dysentery, and in the vicinity of Red Bluff, seems of sufficient interest to mention:

WORMS IN ANTELOPE WATER.

A few days since, John Kimberland, Court House janitor, noticed some small white worms in the water, taken from hose in the Court House yard. He said but little about it then, but concluded to investigate the matter a little further, and ascertain if there was any great number of those worms in the water. Last evening, he left a small stream of water running through a piece of hose, near the Court House, and when he visited it this morning, found at least a double handful of worms in the grass at the mouth of the hose. These worms are about the size of a fine silk thread, from half to an inch and a half long, and almost white, as seen with the naked eye. There were thousands of them, squirming and writhing around in the grass, till the heat of the sun killed them. The water in which they are found comes from Antelope Creek, and from the number seen this morning, the water in the pipes contain millions of them. Dr. Westlake and Prof. Gans examined them under a small microscope, but did not give an opinion as to how they originated, or what effect they would have on the human system, taken into the stomach in the ordinary way of drinking the water in which they are found. *Whether the same kind of worms can be found in the Sacramento River water has not yet been ascertained, so far as we are advised.* Enough, however, is known to warrant the Board of Health in making a thorough examination of the water which the people of Red Bluff are constantly drinking. The cause of disease, according to the germ theory, has not yet been satisfactorily explained to the minds of scientists, and the discovery of worms and eggs not yet hatched out, in the Antelope Creek water, may result in something good after all, not only to the people of Red Bluff but the scientific world. We hope the Board of Health will make a careful and satisfactory examination of the water of the town, and give the public the result of their investigations.

Being desirous of learning the facts, in July I addressed a communication to Dr. G. W. Westlake, of Red Bluff, requesting such information as he could give me. The doctor kindly favored me with a full account of the disease prevalent there, which I take the liberty of introducing in full:

RED BLUFF, CALIFORNIA, July 17, 1883.

F. W. Hatch, M.D.:

DEAR DOCTOR: About the middle of last March Mrs. R. Marnid was attacked with dysentery and was dangerously ill for three weeks. This was the only case in town until the fifteenth of April, when four cases occurred in the extreme south of town, and from that time until the present it has been epidemic. The distance between the residence of the first case and the next is half a mile. It has prevailed in every part of town, and the number of cases in any particular locality depended upon the number of inhabitants. The disease broke out along Elder Creek, twelve miles south of town, at about the same time the four cases occurred in town. It then extended along Elder Creek eighteen miles west of town. Then cases were reported in the foothills of the Sierras east of Red Bluff, and from that to the lumber mills, where there is a population of four hundred. These mills are between five and six thousand feet above us here. There are now a dozen cases on Cottonwood, twenty miles north. There has probably been about three or four hundred cases in the county so far, with a mortality of thirty-five or forty. The mortality has been confined to children aged between nine months and four years; only one case proved fatal above that age.

The prevalence of dysentery cannot be attributed to any local cause; so far as I can learn there has not been even a sporadic case in the town or county for twelve years. We have used the same water here for seven years, breathed about the same air, and our diet has not been changed. Those who used well water in the country, and those who drank the pure water of the mountains and breathed in the breath of the pines and the snowy peaks of the Sierras, have not escaped. Two thirds of the inhabitants of Red Bluff are supplied with water from the Sacramento River; the other third from Antelope Creek, a stream heading forty miles from here in the Sierras. I believe our water supply is as pure and free from all deleterious substances as any town in the State. The river water is pumped directly into large tanks and distributed through town in iron pipes dipped in asphaltum. Antelope water is brought in town six miles through iron pipes and supplies the residents of the south and southwest parts of town. Antelope water is that in which worms were discovered. I investigated the worms thoroughly. There were thousands of small white thread worms found in the water from one hydrant in the Court House square. There were a few found in three other hydrants in the vicinity and none anywhere else in town. Where the worms came from is a mystery; none are to be found now anywhere. The fact is that the inhabitants supplied with Antelope water (in which the worms

were found) did not suffer any more from dysentery than those using well water, river water, or those in the mountains using water above suspicion.

In my opinion the disease is purely *epidemic* and infectious. I could cite many cases that are convincing to me of the infectiousness of the disease. I believe the prevalence in the mountains about the lumber mills is attributable to a case going from here there. We have had every grade of cases, from very mild to very malignant. The symptoms were about as follows in a typical case: Severe cramping, cutting, griping pains in abdomen, high fever, tongue heavily furred, *constant tenesmus*, and quite obstinate constipation of the small intestines, beef brine discharges, with an unusual amount of membrane. From the amount of the latter it would seem to me at times that the epithelium and mucous coats of the entire intestinal canal was sloughing off. Where there was much sloughing of membrane the cases were very tedious, lasting three to four weeks before recovery took place. Many cases in nursing and teething children assumed a choleraic form—collapse came on, coma, convulsions, and death. Probably one fourth or one third of the cases were adults, and the symptoms were about the same as described above. Vomiting was a prominent symptom in about one tenth of the cases.

The treatment we found most successful in the epidemic was sulph. magnes., castor oil, rhubarb, combined with opiates. Astringents, *ipecac.*, camphor, opium, in large doses, were an injury. A full cathartic dose of salts or oil, with sufficient opium to relieve pain at the commencement, and laxative doses every three or four hours during the continuance, we found the best treatment. We tried the treatment recommended by all standard authors of this and other countries, but found salts and sulphur *aroma.*, with ext. opii. the best general prescription. Injections of every kind failed to afford even temporary relief. I tried the following and was disgusted when done: Starch and laudanum (iodoform and oil, olive), lig. ferri per sulph., bismuth, oxide of zinc, chloral, carbolized oil, acetate of lead and glycerine, nitrate of silver, large quantities of hot water (iodine gr. 5, water, mix). Drs. Cameron, West, and Ollendorf were equally as much disgusted with rectal medication as I. Their conclusions regarding internal agents also agree with mine.

I have spoken of the epidemic in the past tense, as it is rapidly disappearing. Not more than a dozen cases in town at present, and they of a milder type. Malarial diseases are prevalent on the ranches among the harvest hands, and I fear that typhoid fever will prevail at a later period, from present indications.

I have written this hurriedly, after the loss of two nights' sleep, and I trust you will kindly overlook the errors.

Yours, very truly,

G. W. WESTLAKE.

An effort was made to obtain some of the water referred to in the communication, but I was unable to do so. From the account given by Dr. Westlake, there does not seem to be much connection between the water supply and the prevalence of disease.

TYPHOID FEVER.

Being engaged in making an official visitation through Napa and Sonoma Counties, my attention was called to what was represented to be an epidemic of typhoid fever, at the large, well appointed orphan asylum, an institution for boys, near San Rafael. A few days subsequently I visited the institution, in company with the Hon. W. W. Moreland and Hon. J. J. Ayers, who were just then engaged in examining into the condition of the charitable institutions of the State. The following pages comprise the result of the investigation, as reported to the committee:

Visited this institution August 7, 1883, with Hon W W Moreland and Hon. J. J. Ayers, the special object of the visit being to ascertain personally the facts concerning the rumored prevalence of typhoid fever there. Was informed by Father Cooke that a fever appeared among the inmates July ninth, there having been fifty cases since that date, only two cases remaining under treatment. These two were then suffering from pulmonary complications. There had been up to this time only four deaths. Probably one or both of those remaining sick will die—*one* from tubercular development. Although medical attendance had been summoned, reliance was placed mainly upon good nursing, and the result shows not only the efficiency of this but also that the fever was of a mild type, and exhibited, to an unusual degree, its self limiting character and a natural tendency towards recovery.

The asylum is pleasantly located in the foothills, a few miles from San Rafael, sheltered from ~~ere~~ sea winds, the land running down to the salt marshes. It has always been regarded as ~~ulthy~~ place, no cases of fever having, it is said, previously occurred there.

The fever came on suddenly, cases following each other in rapid succession. It was generally of a mild form and, as the result shows, remarkably submissive to simple treatment.

From the history of the disease I do not think it was true typhoid fever, but a mild form of typho-malarial fever, or, adopting the views of recent sanitarians, *cesspool* or *sewerage* fever.

The water-closets were located in an annex to the dormitory, the door therefrom opening directly into the latter. The arrangement consisted of a trough, with a series of closet seats, sloping in the direction of the outlet or soil pipe. At the end of the trough is a trap closed by a hollow metal plug, the latter being raised by hand after each use of the closet, allowing the soil to rush forcibly along with an abundance of water down the soil pipe. The latter passes down the side of the house into a drain, and thence, some distance below, into a sewer which empties into a creek near the salt marshes. Neither to the soil pipe, nor to the drain, could any means of ventilation be discovered.

The waste water from the kitchen and from other portions of the building, including, I believe, the bath tubs, empties into an earthern (iron-stone) grease trap or gully, and thence discharges, by syphon action, into the sewer. By means of this trap this portion of the building is properly disconnected from the sewer. The cellar under the kitchen gave a strong and sickening odor of decaying vegetables. Over this cellar is also the dining hall, in which the same odor was clearly perceptible.

The wooden sills supporting an extensive portion of the building had become much decayed from dampness and want of ventilation, and gave a strong and offensive odor. Workmen were already engaged in repairing this defect. The defects thus briefly alluded to may be cheaply remedied by:

First—The ventilation of the soil-pipe, by its continuation above the roof of the house, and its disconnection from the drain by a ventilated trap between the house and the sewer;

Second—The removal of decayed sills and other wood, and the substitution therefor of sound materials, and brick underpinning, with ample ventilating spaces, as already commenced.

Third—The cleansing, disinfecting, and ventilation of the cellars.

Some of the dormitories, though clean and well ventilated by opposite windows, and also, in some instances, by ventilating spaces in the ceiling, are too much crowded. Those dormitories contain 605 beds; one, 220 x 30 x 12 feet, containing 170 beds, or 465 cubic feet for each occupant, if all are in use; one, 70 x 30 x 12 feet, with 35 beds, or 720 cubic feet per capita; a third, 300 x 30 x 12 feet, with 400 beds, and 270 cubic feet of air space per capita.

Not to offer serious objections to No. 1, the cubic air space in No. 3 is certainly too limited. It ought to be 1,000 cubic feet for the sleeping apartments of adults, and surely not less than 500 cubic feet for the youths in this asylum, some of whom must be fifteen years of age, unless it is sought to compensate for the deficiency by ventilation through opposite windows open at night, which, as the bottoms open in the direction of the prevailing winds, can scarcely be effected without occasioning injurious draughts. This may be greatly modified by the expedient, sometimes recommended, of lowering the upper window two or three inches, or more, and fastening upon its top a sheet of zinc, bending the latter inward at such an angle that it will form a sloping surface for the entering air upwards against the ceiling.

It was understood that the sick were not permitted to remain in these dormitories, but were transferred to the hospital and placed under the kind care of a "Sister" of the society.

F. W. HATCH, M.D.

I believe the disease steadily abated and that no fresh cases occurred after August seventh. It may be remarked that the institution is considered one of the best and is admirably located for healthfulness.

YELLOW FEVER.

For the first time in the history of California since its occupation by Americans yellow fever made its appearance in the State, having been imported into the harbor of San Francisco by the steamer Newbern, September 29, 1883. The disease was known to have existed at Guaymas, Mazatlan, and La Paz, on the Mexican coast, and at Hermosillo, and other populous centers in the interior; and although its advent to California was regarded as being by no means improbable, yet when its existence at our doors was announced, some apprehension was entertained lest it might obtain a foothold at Sacramento, Marysville, and other malarial sections of the State. In anticipation, therefore, of its approach, and as soon as the nature of the disease prevailing in Mexico became known, the State Board of Health began the adoption of means to prevent its introduction into California.

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Refugees having been reported to be leaving the plague-stricken districts by way of the Southern Pacific Railroad through Arizona, quarantine was established at Yuma, on the Colorado River, September 25, 1883, with Dr. M. F. Price as inspector. Through the kindness of General Schofield, an order was obtained upon the quartermaster's agent at Yuma to permit the use of the fort near Yuma as a refuge station and hospital if required by the inspector. Mr. Pratt, Assistant General Superintendent of the Southern Pacific Railroad, not only promised the hearty coöperation of the company, but also gave to the Secretary of the Board a letter to Colonel Hewitt, the company's agent at Los Angeles, instructing him to furnish the transportation of whatever might be required. The thanks of the Board are therefore cordially tendered to these gentlemen for the courteous manner in which they so cheerfully acquiesced in all measures tending to facilitate their action in the establishment of quarantine. Dr. Widney, the then resident member of the Board at Los Angeles, was much interested in the work, and ably superintended its operations until about the middle of November, when quarantine was abandoned for the season. The Board of Health of San Francisco also resorted to every possible means to prevent the disease from entering that city; for which purpose the Newbern was quarantined, those afflicted with the fever were removed to a suitable vessel lying at anchor in the bay, and carefully guarded and cared for, while the vessel itself was thoroughly disinfected.

Of the seven persons who arrived upon the Newbern, afflicted with the fever, five recovered and two died and were buried at San Francisco; the bodies, having been first disinfected, were incased in material impervious to the escape of the gases arising from decomposition, as well as the germs of the disease, and then placed in hermetically sealed metallic caskets, before being brought to shore for interment. The efficiency of the measures adopted is best illustrated by the fact, that no new case of the disease appeared in San Francisco, or elsewhere in California.

Three of the vessels, however, belonging to the Pacific Mail Steamship Company were subsequently quarantined, six persons in all having been found ill of the disease, only one of whom died. The weather having become cooler, and the epidemic in Mexico having been reported to have subsided, quarantine at Yuma was discontinued for the season November fifteenth. For the purpose, however, of preventing its introduction into California during the following Summer, should it, as was anticipated, reappear in Mexico on the return of warm weather, the Board deputed two of its members, Dr. Cluness and myself, to visit the various exposed ports upon the southern coast line, with the view of making preparation for the establishment of quarantine where and when it might be deemed necessary. For this purpose the committee left Sacramento early in December last for Los Angeles, where a day was spent in consultation with Drs. Orme and Ross, Dr. Widney, the then resident member of the Board having been temporarily absent, and it was learned that as no vessels from Mexican ports touched at Wilmington, the port of entry for that section of the State, the only way by which the fever could reach us must be over the Southern Pacific Railroad, and as the local Board of Health had already taken the necessary precautions against its introduction by this route, no additional means were deemed advisable at that point.

Upon our arrival at San Diego it was ascertained that a fleet of small trading vessels had been plying between that port and those on the Mexican coast, and that in addition there was a considerable number of persons arriving overland at intervals of a few days, either on horseback or in wagons, bringing with them gold from the mines to be exchanged for goods. A brief interview having been had with a few of the citizens, and the object of our visit having been made known, it was determined that we should meet for consultation in the evening at the office of Dr. Stockton, at which meeting Drs. Remondino and Stockton, the President of the Board of Supervisors, the District Attorney, and others, were present. The committee found the authorities at San Diego, as well as all present, wide-awake and ready to coöperate with them in all things necessary. They found, nevertheless, that there was but little available money in the County Treasury, and as there was but little at the disposal of the State Board of Health, it was agreed that the authorities of San Diego should take such precautions against the introduction of the disease as were within their power, and that, should it become necessary, the Board would render them all possible assistance.

The next objective point being Yuma, Arizona, we set out thither, and found Dr. Price, who had been acting for the Board at that station as quarantine officer, as already stated, ready to renew his appointment whenever called upon. At Tucson the committee had a very interesting interview with Drs. Handy and Matas, the former taking strong and decided grounds against the existence of yellow fever in Mexico, the latter being equally well convinced that the disease was yellow fever and nothing else. The committee soon became convinced of the correctness of Dr. Matas' view, and determined to govern themselves accordingly. It should be here observed, however, that Dr. Matas had had much experience in the treatment of yellow fever, not only at Hermosillo, during the prevalence of the epidemic then subsiding, but also on former occasions at Brownsville, Texas, and at Vera Cruz, while Dr. Handy had never seen the disease, excepting in the form in which it appeared amongst a few of the refugees and travelers who had reached Tucson. In a letter received from Dr. Handy, dated last July, the arrival and death, from yellow fever, at Tucson, of a railroad passenger, is reported, thus convincing him of the error of his previous diagnosis.

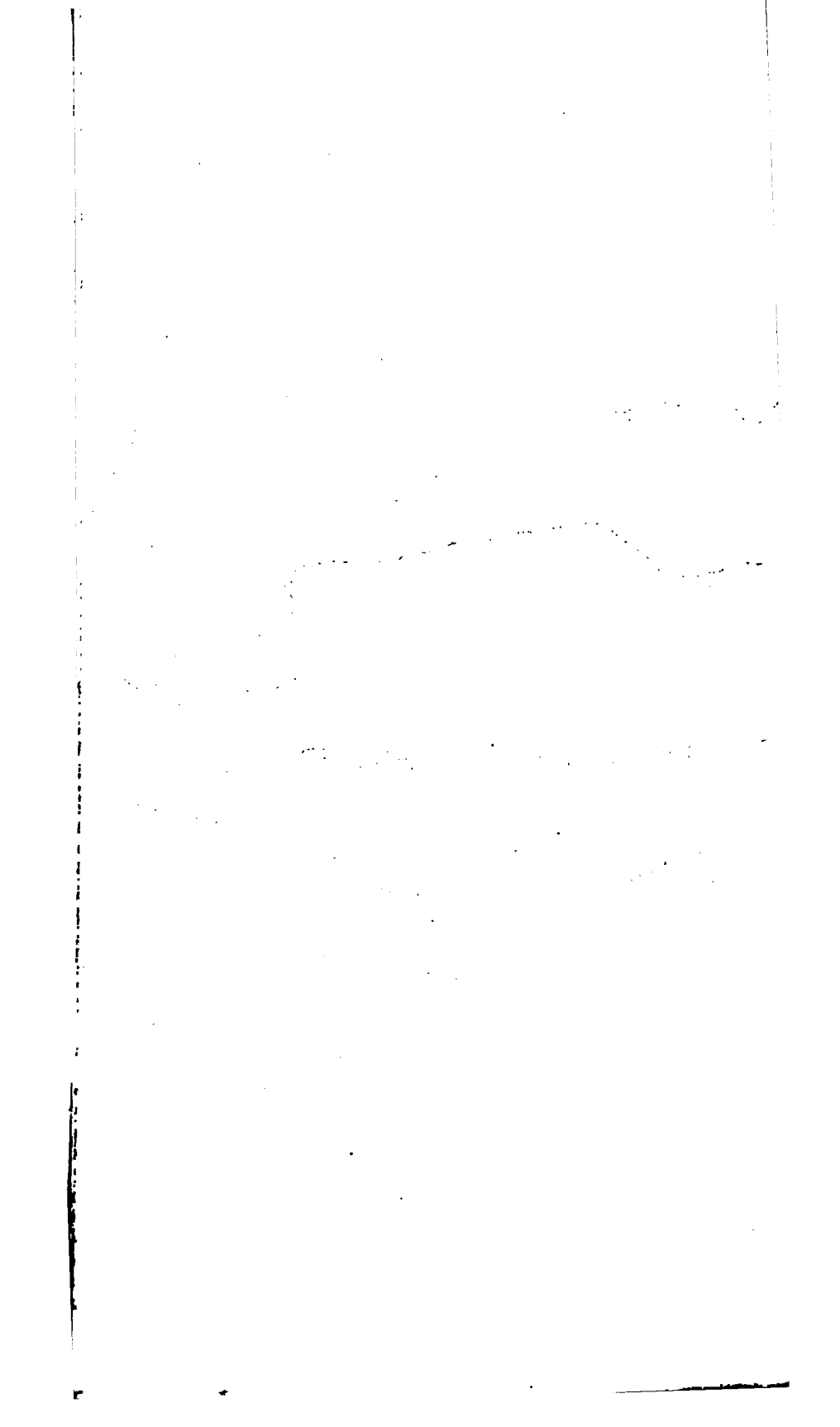
The disease having been reported as reappearing in Mexico, July, 1884, the Board reëstablished quarantine at Yuma, and appointed Dr. H. Y. Baldwin as Inspector, Dr. Price having declined reappointment. It is gratifying, however, to be enabled to say that although many cases occurred in Mexico, yet the most rigid inspection of all the cars, both passenger and emigrant, failed to discover a single case at Yuma, nor has any case thus far reached San Francisco or any other part of the State.

But in addition to the measures reported for the prevention of the introduction of this pestilence into our State, it is but just to say that Surgeon-General Hamilton, of the United States Hospital Marine service, early established quarantine at Nogales, on the line between Arizona and Mexico, and it is not doubted has thus done much to prevent the disease from reaching California; for, so far as can be ascertained, the case reported by Dr. Handy is the only one which has this year been heard of this side of Nogales. The Board are also under obligations to that gentleman for information, from time to

time, as to the progress of the disease, as taken from the reports of his office in Washington.

The Southern Pacific Railroad Company also instructed their physician at Tucson, Dr. Handy, to resort to all possible means to prevent its reaching or getting beyond that point. While, therefore, it would appear as if the efforts of the Board, in preventing yellow fever from entering our State, had been measurably anticipated by the National Government and by the Southern Pacific Railroad Company, they nevertheless realize the importance of maintaining quarantine at Yuma, as well as at other exposed points, whenever the disease is known to exist in Mexico or any other neighboring State. Precautions being thus taken at Nogales and at Tucson, and the most cordial relations and constant interchange of views existing between Dr. Baldwin, Quarantine Officer at Yuma, and the officials at the points named, it is believed to be quite improbable that the disease can reach California by this route, a little cheap newspaper notoriety on the part of some engaged in health service at San Francisco to the contrary notwithstanding.

Reference having been made to the fact that it was feared that should yellow fever ever reach the malarial sections of this State it might there find those influences which favor its propagation, it may not be out of place to state that it does not depend either for its origin or propagation upon those causes and conditions which generate malarial paroxysmal fever, from which it differs essentially in its symptoms and pathology. It is known, nevertheless, that it requires a temperature of not less than 70° to propagate it, and such temperature being common throughout the Sacramento Valley, it is believed that should it chance to reach us during the existence of that epidemic constitution of the atmosphere which sometimes prevails, its propagation and spread would surely follow. It may also be stated that the generally accepted idea that it cannot prevail at the height of 2,500 feet above the sea level is erroneous, for upon the elevated plains of Caracas, 3,500 feet above the level of the sea, it has prevailed on more than one occasion; while in Cusco, at an elevation of 11,378 feet, and at places in the Andes, at the height of 14,000 feet, it has committed fearful ravages. There are also those amongst us who still doubt that the epidemic prevailing in Mexico is yellow fever, and who attribute the manifestations wholly to telluric influences which develop a malignant form of remittent fever. When, however, we consider the various manifestations of the present disease, the intense capillary congestion, the cardiac depression, the vomiting, the delirium, the coma, the hemorrhage, the urinary suppression, and the jaundice—conditions not compatible with any other known disease—it would appear that these evidences may justly be referred to the action of a specific poison, and that however prominent any one of these symptons may be, and however much cases may differ from each other, when taken in conjunction they unmistakably point to the existence of that disease only which is known as yellow fever. When these concomitants are considered, all of which are known to have existed in many of the cases that have occurred in Mexico, and when we include in addition the very important factor of direct communication with an infected region, it would appear that there is not an unbroken link in the chain of evidence. The Board entertains no doubt of the nature of the disease, and has at all times acted accordingly. It has also frequently endeavored to impress



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H. GIBBONS, M.D.,
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Committee.

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To his Excellency [illegible]

The undersigned committee [illegible]
Resolution Number Six, adopted February [illegible]

Resolved jointly by the Senate and Assembly, That [illegible] the Governor from the members of the State Board of [illegible] consider the subject of a suitable place for State Quaran[illegible] suitable locality upon the Bay of San Francisco, with e[illegible] an establishment; to suggest such amendments to the pre[illegible] necessary; to devise a general scheme for the construction, [illegible] said quarantine station; and to report the result of their [illegible] next session. Said committee to serve without compensation.

of California.

Respectfully report:

That subsequent to their appointment under the provisions of [illegible] they were about to enter upon the work assigned them, a commu[illegible] President of the United States, at the instance of the National Board [illegible] the sanitary relations of San Francisco, and to select a site for a quara[illegible] necessary for the General Government to establish one there for the [illegible] careful inspection of various localities, that commission made choice of [illegible] between Tiberon Point and Peninsular Point, and recommended the [illegible] locality. The course of Congress, however, in withholding appropriation[illegible] Board, and the exhaustion of the fund applicable to the purpose, prevented [illegible] in this direction.

Afterwards your committee proceeded to inspect for themselves the several [illegible] launch of the City Board of Health being kindly placed at their service. At [illegible] they came to the same conclusion as the commission appointed by the Presid[illegible] report accordingly. But on making inquiry as to the tenure of the land, it was [illegible] the North Pacific Railroad Company was about extending their track to Tiberon [illegible] that the owner of the property would not consent to part with it on any te[illegible] planned making it a town site. For these reasons the committee abandoned the [illegible] quarantine station at that locality.

A quarantine station requires space for buildings, a sufficient supply of fresh wa[illegible] convenient anchorage ground, not too much exposed to storms. It must also be isolate[illegible] degree from human habitations, and from the current of travel. Such a locality is [illegible] found. The most natural and suitable one for the purpose is on Angel Island, a small pr[illegible] tory of which extends from the northeasterly side, and possesses all the necessary qualities [illegible] locality was selected several years ago, and an effort made to secure it; but the officers of [illegible] ernment, who, with their families, reside on the other side of the island, protested against [illegible] measure, and it was found necessary to abandon it. Nevertheless, your committee [illegible] sufficient reason for the opposition, and still regard it as the most suitable and desirable locat[illegible] for the object in view. Deeming it inexpedient, however, to urge this locality if any [illegible]

possible, inquiry has been extended to the eastern side of the bay in Contra Costa County, not far from the line of Alameda County. Here is a peninsula several miles long and quite narrow, separated from the main land by a body of salt marsh, and forming a part of the San Pablo Grant. Point Richmond projects from the peninsula, stretching out nearly to deep water. Buildings can be erected here with but little grading. A space of twenty or thirty acres could be cut off from inland access by digging, so as to make a high bluff, or perpendicular wall. It is probable that artesian water could be procured by boring. Otherwise, water could be carried in pipes from some source in the foothills a few miles distant. There is deep water in the bay near by, with a good anchorage ground.

There is another point on the same promontory, nearly two miles farther north, called Molate Point, to which the description given of Point Richmond will very nearly apply.

As the neighborhood of these places is practically without population, and as the land presents no inducement to settlers, the owner or owners would probably part with a sufficient quantity for a moderate compensation. Two members of the committee inspected the localities herein designated and find the only objection to that first named is the occupation of a portion of the land by a large brickyard. A map of the locality accompanies this report.

Their attention has also been directed to a point on the shore of the bay about two miles north of Richmond Point, and not amenable to any such objection. There is to be obtained a greater extent of frontage on the bay for the buildings required on the station; and an advantageous position for a quarantine ground for vessels, isolated from the public travel, with a depth of from four to eight fathoms of water at the mean tide of the lowest low water. The main channel is between the Castro Rocks and Red Rock. A map with a more detailed description of this second locality is in the possession of the committee, and at the service of any committee which may be appointed by the Senate and Assembly. For this, and other valuable assistance rendered, they are indebted to the courtesy of Mr. C. D. Gibbes, C.E.

The point and neighborhood are entirely uninhabited, and it is not probable that any other suitable locality could be procured at so little cost. The ranch is under litigation, and as no legal title could be given by either of the claimants, it would be necessary to condemn the required portion and make payment to the party which shall gain the suit.

The distance of the proposed locality from San Francisco is a decided objection, but one which, to all appearance, cannot be obviated. The committee would suggest that *every year increases the difficulty of obtaining a station for quarantine*, owing to the rapid occupation and improvement of the country bordering on the bay. In the light of utility and economy, it is not probable, if the present opportunity be allowed to pass, that another so favorable will offer in future years.

It is believed that the quarantine laws now in force are applicable, in the main, to our present condition. The claims relating to *fines* might, however, be more explicit, more clearly defining the party liable whether the master or owner of a vessel. In addition to what has been said as to the requirements of a quarantine station, there may be added a steam vessel for the Quarantine Officer, a hospital for those sick with infectious diseases, a building for passengers not sick but detained for inspection, a house for quarantine officers, a warehouse for the cargoes from infected vessels requiring disinfection, and a wharf. The former of these—a steam quarantine vessel the State already possesses. The cost of the necessary buildings the committee are unable to estimate, without assuming the responsibility of having plans prepared with specifications, a duty not contemplated by the resolution under which our appointment was made.

The buildings should be substantial, yet plain, and without expensive ornamentation. The committee beg leave to suggest, however, that the question of *cost* is of minor consideration when contrasted with the importance of the object to be attained. The necessity of providing for an effective quarantine system at the port of San Francisco is generally recognized. We need protection, not only against smallpox, as during the past year, but against other epidemics liable to reach us. So important is it that it has been regarded as a proper subject for interference on the part of the national authorities, who, as already mentioned in this report, recently took steps preliminary to the establishment of a quarantine in the harbor of San Francisco under national supervision, and who, in concluding their report upon this subject, say, after alluding to the subject of smallpox as a local danger, "when the devastation effected by cholera in Japan since April last is considered in connection with the intercourse between Yokohama and San Francisco, and the railroad facilities between the latter port and the whole of the United States, the subject assumes a larger proportion, and in the event of inability on the part of State or municipal authorities to establish a local quarantine, a recommendation by this Board for the establishment of a refuge station on the Pacific Coast seems called for by the general interests of the country."

In addition to the cost of site, wharf, and buildings, there would be the expense attendant upon the management of the system—officers, attendants, provisions, etc.; but these are so clearly contingent upon emergencies which may or may not arise—such as the arrival of infected vessels, for example—that no proper estimate of them can be made.

The committee cannot conclude their report without deprecating the most barbarous hostility manifested by many people against establishing a quarantine near their abodes. The seeds of infection are rarely carried far by the atmosphere—scarcely ever beyond the walls of the building occupied by the sick. For several years past all patients, or nearly all, suffering from smallpox and some other maladies, have been transported to the Twenty-sixth Street Hospital; though dwellings stand around in all directions, and the sick are transported to the hos-

pital in the main thoroughfares, not a single case of smallpox has been developed in the surrounding region. If a quarantine station should be established in the harbor of San Francisco with a hospital attached, the hospital might be entirely empty for months together, and there might not be an infected ship at the anchorage for a year. Such really would have been the condition of a quarantine station during the last few months. It is lamentable that in this enlightened period, men of intelligence should cherish a senseless and cruel prejudice hostile to the best interests of humanity.

All which is respectfully submitted.

H. GIBBONS, M.D.,
CHESTER ROWELL, M.D.,
F. W. HATCH, M.D.,
Committee.

SAN FRANCISCO, January 25, 1883.

The committee still believe that the site selected, though not the best the harbor affords, is the best now available. They cannot too strongly urge such action on the part of the Legislature as will secure for the State an object so much needed. At the last session a bill was proposed, which seemed to be entirely unobjectionable to the members consulted—its passage recommended by the committee to whom it was referred, and only failed, because of too long delay in putting it to its final passage. Another bill for the same purpose should be introduced as early as possible in the next session, and its passage promptly secured.

Another measure, the importance of which the events of the past year have fully demonstrated, is the provision by the Legislature of a fund, to be placed at the disposal of the Governor, for the purpose of maintaining in an emergency an efficient inland quarantine or inspection system. At the legislative session of 1882, the following joint resolution was passed, and the sum of $500 appropriated, to be used exclusively for quarantine purposes:

CHAPTER XC.

An Act to prevent the introduction of contagious or infectious diseases into the State of California.

[Approved March 15, 1883.]

The People of the State of California, represented in Senate and Assembly, do enact as follows:

SECTION 1. Whenever there shall exist, in the opinion of the State Board of Health, imminent danger of the introduction of contagious or infectious diseases into the State of California, by means of railroad communication with other States, the said State Board of Health are authorized, and it is hereby made their duty, to make or cause to be made, by an accredited agent or inspector, an inspection of all railroad cars coming into the State at such point, or between such points within the State limits as may be selected for the purpose.

SEC. 2. Such inspection shall be made, where practicable, during the ordinary detention of a train at a station, or while in transit between stations, and in all cases shall be so conducted as to occasion the least possible detention or interruption of travel or inconvenience to the railroad companies, so far as consistent with the purposes of this Act.

SEC. 3. Should the discovery be made of the existence among the passengers of any case or cases of dangerous contagious or infectious disease, the said Board of Health, or their agent or inspector, under rules and conditions prescribed by them as being applicable to the nature of the disease, shall have power to cause the side-tracking or detention of any car or cars so infected, to isolate the sick or remove them to a suitable place for treatment, to establish a suitable refuge station, to cause the passengers and materials in such infected car to be subjected to disinfection and cleansing before proceeding further into the State, and, in the case of smallpox, to offer free vaccination to all persons exposed in any car or at any station.

SEC. 4. The sum of five hundred dollars is hereby appropriated out of any moneys in the treasury not otherwise appropriated, to be expended solely for the purposes of this Act, and all expenditures herein authorized shall be specified in an itemized account to be presented to the State Board of Examiners, and paid as other demands on the treasury are paid; *provided*, that in no case shall the sum expended exceed that herein specially appropriated for the purpose.

SEC. 5. This Act shall take effect from and after its passage.

That sum, though small, has been of material assistance in the quarantine work in which we were subsequently compelled to engage.

It is, however, now exhausted, and the Board has been compelled to draw upon an already overtaxed Board of Health fund, for the means of conducting a quarantine against yellow fever, now prevalent in Sonora and other parts of Mexico. Sanitary inspection will probably be required at Yuma, on the Colorado River, for some time to come, and possibly at other points; the expense attendant upon such operations depends upon so many contingencies, which may or may not occur, but which it is the part of wisdom to provide for, that it is impossible to estimate closely the amount of money required for the efficient and creditable prosecution of the work. Besides, another danger threatens us, which we will probably be compelled to encounter, if not during the present year, at least during the next, of the spread of cholera from European ports to this country. Should such be the case, a rigid system of surveillance will be imperatively demanded. It is respectfully urged, therefore, that an earnest appeal be made to the Legislature, through his Excellency the Governor, to appropriate a sum, not exceeding $10,000, to be placed at the disposal of his Excellency, and which shall be used upon recommendation of the State Board of Health, and with his approval, solely for quarantine purposes. The appropriation will thus be well guarded, and if not required for the specific purpose thus mentioned, will revert to the treasury of the State.

One other subject will conclude this portion of my report. There are indications of the possible reappearance of smallpox along the lines of travel between this and other States. Should this prove to be the case, the work of quarantine will be additionally arduous and expensive, for whatever difference of opinion may exist as to the portability of the other diseases mentioned by inter-State travel, there can be none about the possibility of smallpox being so communicable. Happily we have in vaccination a certain preventive against smallpox, but, unfortunately, too many neglect to avail themselves of this precious means of protection. I firmly believe that if every child born in the United States was properly vaccinated in infancy, and again on arriving at the age of puberty, smallpox would become effectually and forever stamped out. Such a measure, however sanctioned by law, would meet with so much opposition from ignorance and prejudice that I should hesitate to advise it. Much good can, however, be effected through the public schools, which should require the presentation of a certificate by every child of previous vaccination, vouched for by competent authority. This subject was spoken of in the last biennial report of the Board, and its consideration urged upon the Legislature. A bill was prepared, introduced, favorably recommended by the Hospital Committee, and passed, I believe, to the third reading, but was never called up for final passage. What was said upon the subject then is applicable to the present time. I take the liberty of repeating a few passages from the last report of the Board:

"It cannot be too often reiterated that, if vaccination were generally adopted—if it were made compulsory—the danger of an epidemic of smallpox would be reduced almost to an infinitesimal quantity. I do not mean vaccination as often performed by parents upon their children, or by ignorant itinerants who proffer their services for a fee, but never take the care to ascertain whether the sore produced is genuine, and who would, perhaps, be unab[illegible]nish the true om the spurious; but vaccination in its p[illegible] with active,

reliable lymph, properly inserted, and carefully inspected by a competent judge at the right time. It is the neglect of proper care in the simple matter of vaccination that has shaken the faith of so many in its efficacy.

"The idea of a general system of compulsory vaccination would probably excite opposition among those unwilling to be convinced of its efficacy. But the State has a duty to perform in this connection which should not be unheeded; and we, the chosen advisors of the State in matters pertaining to public health, should not hesitate to point out the true policy, and seek to educate the public as to the vast benefits to be derived from so safe and simple an operation.

"We may, however, secure this result, more slowly, indeed, yet with equal ultimate certainty, through our common schools.

"The State is the legitimate guardian of its youth. It is upon each succeeding generation that the future prosperity of the State must depend. It has provided a munificent system of education for all who are willing to avail themselves of its advantages. As it would undoubtedly have the right to exclude from the schools any one having smallpox or other contagious or infectious disease, so it surely has the right to place its interdiction on those who, by neglect, might render themselves in any way liable to become the carriers of this loathsome disease.

"Let it be established, then, that no unvaccinated child shall be permitted to enter the school; and let the Trustees of schools everywhere, in every school district in the State, be required to enforce this law—the penalty being the forfeiture of the State support. Happily, in some of the cities a stringent rule has been adopted. But it should be universal. It should apply to the country not less than the cities, for all are liable to exposure. Indeed, the history of smallpox in this State during the past two years has shown that it has prevailed in the country, in respect of localities, quite as generally as in the cities. A law similar to that suggested is to be found on the statutes of New York, and perhaps other States; and though it appears to have been very loosely obeyed, on the principle of fancied security in the absence of any pressing menace, the State Board of New York have recently called attention to it, and demanded its enforcement.

"I respectfully suggest that the consideration of his Excellency the Governor, and of the Legislature, be earnestly invited to this subject. A law like that alluded to, but modified, if required, to suit the situation in this State, rigidly enforced, would afford us, in a comparatively few years, a population so nearly exempt from liability to smallpox as to render a sweeping and disastrous epidemic of that disease quite impossible.

"Such is my faith in vaccination, and such is the legitimate conclusion warranted by the whole history of the measure from its first introduction by Jenner to the present day."

How successfully such a measure may be carried out, and what excellent results can ensue therefrom, is forcibly shown by the distinguished Secretary of the State Board of Health of Illinois, Dr. John H. Rouch, in his fifth annual report, 1883. The mandate of the Board of Health of Illinois in relation to sanitary matters carries with it the authority of law. During the smallpox epidemic of 1880–82 this authority was invoked, with the most gratifying results. In allusion to this subject Dr. Rouch remarks, "that as a result of our school vaccination order, the State Superintendent of Public Instruc-

tion agrees with me in the estimate that about 600,000 school children have been efficiently vaccinated, mainly with bovine virus, by competent physicians, who have been obliged to certify to the *result* of their work, and not merely that they have performed the operation."

I respectfully suggest that the three subjects thus briefly alluded to be referred to the legislative committee, with instructions to prepare bills and present them to the next Legislature as early in the session as practicable.

TABLE No. 1.

Report to the State Board of Health of the Indigent Sick treated in the following Hospitals, for the year ending December 31, 1883.

Name and Location of Hospital.	Number of Months Reported.	Total on Hand at Commencement of Year	Total Admitted	Discharged	Died	Percentage of Deaths	Remaining Under Treatment.	Physician's Name and Post Office Address.
Napa Asylum for the Insane	12	1,107	510	313	110	6.4	1,284	E. T. Wilkins, M.D., Napa, California
State Insane Asylum	12	1,139	275	113	95	6.7	1,206	W. T. Brown, M.D., Stockton, California
Tehama County Hospital	12	21	109	99	10	7.7	21	John Fife, M.D., Tehama, California
Fresno County Hospital	12	19	122	112	13	9.2	16	Lewis Leach, M.D., Fresno, California
Santa Barbara County Hospital	12	3	18	9	7	33.3	5	S. B. P. Knox, M.D., Santa Barbara, California
San Bernardino County Hospital	12	21	29	27	7	14.0	16	T. C. Peacock, M.D., San Bernardino, California
Sonoma County Hospital	12	28	167	146	23	11.8	26	B. S. Young, M.D., Santa Rosa, California
El Dorado County Hospital	12	46	63	36	17	15.6	56	H. W. A. Worthen, M.D., Placerville, California
Humboldt County Hospital	12	20	62	52	11	13.4	19	Thomas Graham, M.D., Eureka, California
Santa Cruz County Hospital	12	16	51	38	10	14.9	19	Benjamin Knight, M.D., Santa Cruz, California
Shasta County Hospital	12	35	93	90	14	10.9	24	J. M. Briceland, M.D., Shasta, California
Nevada County Hospital	24	52	235	188	43	15.0	56	R. M. Hunt, M.D., Nevada City, California
Central Pacific Railroad Hospital	12	56	3,257	3,283	30	.9	48	A. B. Nixon, M.D., Sacramento, California

TABLE No. 2.

Principal Diseases Reported from Hospitals.

Name of Hospital.	Location.	Diseases of Respiratory Organs.				Fevers.				Diseases, Brain and Nervous System, including Insanity	Bright's Disease and Nephritis	Diseases of the Liver	Diarrhœa and Dysentery	Other Diseases of the Stomach and Bowels	Diphtheria	Heart Disease	Aneurism	Erysipelas	Rheumatism and Gout	Scrofula	Ulcer	Typhoid Fever	Other Diseases	Smallpox	Injuries
		Consumption	Pneumonia	Bronchitis	Other Diseases of the Respiratory Organs	Typhoid and Typho-Malarial	Remittent	Intermittent	Cerebro-Spinal																
State Asylum for the Insane	Napa									1,707															
State Insane Asylum	Stockton									1,414															
Tehama Co. Hospital	Red Bluff	3	1	2		2	18	28		2	1	1	12	2			1								
Fresno Co. Hospital	Fresno	5	5	16		6	5	10		1			4	10		4	1	1	27	12		1	33	10	
S. Barbara Co. Hospital	Santa Barbara	8		1		1		1																	
San Bernardino Co. Hospital	S. Bernardino	6			3		7				1								2				2		
Dorado Co. Hospital	Placerville	2						3												3	3		12		
nboldt Co. Hospital.*	Eureka																								
a Cruz Co. Hospital	Santa Cruz	3	2	1	3			1				2	1					1	4	1			14		
ma Co. Hospital	Santa Rosa	13	5	3		1	1			2	2		1	3		13			14	1	3		60	14	8
ta Co. Hospital	Shasta	4			11	1		7					2										60		
ada Co. Hospital	Nevada City	5	8	4		3		4		1	2												14		
. Railroad Hospital	Sacramento	15	25	8	7	3	1,201		2	1	21		28	3	3	1		12	182		1		1,108	220	

*No diseases named in the report except those which proved fatal.

TABLE No. 3.

Deaths Reported from Hospitals.

Name of Hospital.	Location.	Diseases of Respiratory System.				Fevers.				Diseases of the Brain and Nervous System, including Insanity.	Bright's Disease and Nephritis.	Disease of the Liver.	Diarrhœa and Dysentery.	Other Diseases of the Stomach and Bowels.	Diphtheria.	Heart Disease.	Aneurism.	Erysipelas.	Rheumatism and Gout.	Alcoholism.	Cancer.	Venereal Disease.	Smallpox.	Other Diseases.	Accidents.
		Consumption.	Pneumonia.	Bronchitis.	Other Diseases of the Respiratory Organs.	Typhoid and Typho-Malarial.	Remittent.	Intermittent.	Cerebro-Spinal.																
State Asylum for the Insane	Napa	18	----	----	3	----	----	----	----	22	----	----	----	----	----	1	----	----	----	----	----	----	----	55	1
State Insane Asylum	Stockton	21	2	----	1	2	----	----	----	13	----	1	----	----	----	3	----	----	1	----	1	----	----	49	1
Tehama County Hospital	Red Bluff	2	----	----	----	----	----	----	----	----	----	1	----	2	----	----	1	----	----	2	----	----	----	1	1
Fresno County Hospital	Fresno	3	----	1	----	----	----	----	----	----	----	----	----	----	----	2	1	----	----	2	----	----	----	4	---
Santa Barbara Co. Hospital	Santa Barbara	5	----	----	----	----	----	----	----	----	----	---	----	----	----	----	----	----	----	----	----	----	----	2	---
S. Bernardino Co. Hospital	San Bernardino	5	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	2	----	----	---
El Dorado County Hospital	Placerville	2	----	----	----	----	----	3	----	----	----	----	----	----	----	----	----	----	1	----	1	----	----	10	---
Humboldt Co. Hospital	Eureka	5	----	----	----	----	----	----	----	----	----	----	----	----	----	1	----	----	1	1	----	----	----	3	---
Santa Cruz Co. Hospital	Santa Cruz	----	1	----	----	----	----	----	----	----	----	2	----	----	----	----	----	----	1	1	----	----	----	4	1
Sonoma County Hospital	Santa Rosa	1	2	----	----	1	----	----	----	----	1	----	----	1	----	2	----	----	1	1	2	----	----	5	6
Shasta County Hospital	Shasta	1	----	1	----	----	----	----	----	----	----	----	----	----	----	1	----	----	----	1	3	----	----	7	---
Nevada County Hospital	Nevada City	4	4	2	----	2	----	4	----	----	1	----	----	----	----	1	----	----	3	1	----	2	----	19	---
C. P. Railroad Hospital	Sacramento	3	6	1	1	1	----	----	1	1	1	----	----	----	1	1	1	----	----	----	1	----	----	6	5

COUNTY HOSPITALS.

It is to be regretted that the coöperation of Superintendents of County Hospitals cannot be more generally secured. Only ten have reported, notwithstanding blanks were furnished at an early day to all. Among those not included in this report are some of the best appointed hospitals in the State, such as Sacramento, San Francisco, Alameda, and Colusa. We give below the reports of those who have answered the communications·

TREATED IN THE CENTRAL PACIFIC RAILROAD HOSPITAL

And in Private Houses, for the year ending December, 1863.

Total by each Disease.	Diseases.	Number of Deaths by each Disease.
1	Tibula and tibia of right leg fractured, left leg crushed, and amputated—pyemia	1
3	Amputation of legs	
1	Amputation of hands	
1	Amputation of arm	
4	Amputation of toes	
12	Amputation of fingers	
1	Aneurism arch aorta	1
4	Asthma	
1	Abscess, gluteal	
1	Abscess, coxera	
2	Abscess, axillary	
2	Abscess of foot	
3	Abscess of face	
5	Abscess, alveola	
1	Abscess of knee	
2	Abscess, glandular	
1	Abscess of hand	
3	Abscess of ear	
1	Acne	
1	Adenomeer	
4	Bruised thigh	
4	Bruised arm	
1	Bruised leg and scalp wound	
18	Bruised legs	
2	Bruised shoulders	
1	Bruised face	
1	Bruised back and feet	
1	Bruised back	
7	Bruised side	
2	Bruised hip	
6	Burnt hands	
4	Burnt eye	
6	Burnt arm	
4	Burnt feet	
1	Burnt face	
13	Boils	
6	Bronchitis	1
80	Crushed hands	
21	Crushed fingers—Pyemia	1
56	Crushed feet	
1	Crushed toe	
1	Crushed both legs—entered moribund	1
6	Chronic sore legs	
2	Concussion of the chest	
1	Concussion of the hip and scalp wound	
1	Concussion, general	
2	Concussion of the brain and scalp wound	
4	Concussion of the brain	
1	Concussion of the abdomen	
1	Concussion of the spine	

PATIENTS TREATED IN THE CENTRAL PACIFIC RAILROAD HOSPITAL, ETC.—Continued.

Total by each Disease.	Diseases.	Number of Deaths by each Disease.
4	Colic, "lead"	
13	Conjunctivitis	
1	Cancer	1
15	Consumption	3
13	Catarrh	
27	Constipation	
656	Colds	
5	Cerebral diseases	
5	Cistitis	
18	Cardiac disease	2
2	Cerebro-spinal meningitis	1
1	Colonitis	
3	Carbuncles	
68	Diarrhœa	
67	Dyspepsia	
1	Diabetis	
1	Dislocation of shoulder	
2	Dislocation of ankle	
1	Dislocation of ankle and fractured tibula	
1	Dislocation of thigh	
1	Dislocation of finger, "compound"	
3	Diphtheria	1
25	Debility	
1	Epilepsy	
15	Erysipelas	
6	Earache	
25	Eczema	
1,200	Fevers, malarial	
2	Fevers, typho	
1	Fever, malarial, "pernicious"	1
1	Fever, scarlet, malignant	1
1	Fractured leg—compound	
7	Fractured legs	
6	Fractured ribs	
2	Fracture of forearm	
1	Fractured knee-cap	
1	Fractured forearm, knee and face bruised	
1	Fracture of nasal bone	
1	Fractured clavicle	
3	Fractured fingers	
1	Fractured forearm—compound	
1	Fractured left os-calcis	
1	Fracture metacarpal bone	
1	Fracture of elbow	
1	Fracture of right thigh, middle third, and fracture of forearm	
1	Fractured wrist—colles	
1	Fracture introcapsular left femur, Colles fracture right forearm, fracture superior maxillary, and concussion of the spine	1
8	Felons	
1	Fistula in ano	
3	Fatty tumors	
2	Glandular swelling in groin	
4	Hepatitis	1
4	Herpes Zoster	
1	Hemorrhage of the bladder	
3	Hemorrhage of the lungs	1
10	Hemorrhoids	
7	Incised wound of the feet	
14	Incised wound of hand	
1	Incised wound of ankle	
5	Incised wound of legs	
2	Incised wound of face	
11	Incised wound of scalp	
1	Incised wound of jaw	
2	Inflammation of the bowels	
1	Insanity	

Table showing the number of patients treated in hospital for year 1883.

Present from last report	56
January, admitted	66
February	47
March	57
April	40
May	35
June	41
July	49
August	88
September	94
October	86
November	64
December	65
Total	788

Table showing the number of private house and office patients treated for the year 1883.

January	180
February	221
March	215
April	142
May	165
June	196
July	227
August	200
September	235
October	268
November	239
December	237
Total	2,525

Table showing the number of deaths for the year 1883.

January	3
February	2
March	3
April	2
May	2
June	
July	
August	2
September	5
October	4
November	2
December	5
Total	30

Nativity of patients received into the hospital, as follows:

Nativity.	No.	Nativity.	No.
Austria	1	Nevada	1
Australia	2	Norway	2
Alabama	1	New Brunswick	4
British Columbia	1	New Hampshire	2
California	65	Nova Scotia	7
Canada	28	New York	63
Connecticut	4	North Carolina	2
Cape Verde Islands	2	New Jersey	5
Denmark	4	Nebraska	1
Delaware	1	Ohio	38
England	42	Oregon	5
Finland	2	Pennsylvania	24
France	1	Prussia	3
Germany	31	Prince Edward Island	2
Georgia	4	Portugal	1
Hungary	1	Poland	1
Holland	2	Rhode Island	2
Ireland	125	Switzerland	1
Illinois	30	Sweden	15
Indiana	17	South Carolina	1
Italy	18	Scotland	12
Iowa	8	Tennessee	2
Kansas	2	Texas	3
Kentucky	7	Utah	3
Louisiana	3	Virginia	6
Massachusetts	27	Vermont	21
Maine	14	Wales	3
Missouri	18	Wisconsin	9
Michigan	6	Western Island	23
Maryland	4		

Present from last report, December 31, 1882	56
Total number admitted into hospital, 1883	732
Total number private house and office patients treated, 1883	2,525
Total	3,313
Total number of deaths for the year 1883	30
Percentage of deaths, nine tenths of one per cent.	
The average age of all patients treated in the hospital during the year 1883	32 years
Aggregate number of days of all patients treated in the hospital during the year 1883	18,044
Total cost per day per patient treated in the hospital for 1883	$2 12
Total cost per month of private house and office patients treated, 1883	$1 28

Salary of officers and employés, drugs, provisions, liquors, and incidentals, as follows:

Employés time for the year	$17,237 81
Provisions, etc.	11,434 36
Drugs and liquors	3,615 88
Incidentals (which includes repairs done to hospital)	9,168 26
Total	$41,456 31
Number of patients on hand, under treatment, December 31, 1883	48

Officers.

J. R. Watson	Superintendent
A. B. Nixon	Physician and Surgeon
T. W. Huntington	Assistant Physician and Surgeon
Robert Forbes	Dispenser and Steward
C. H. Wilder	Clerk

A. B. NIXON, M.D.
THOS. W. HUNTINGTON, M.D.

REPORT TO THE STATE BOARD OF HEALTH OF THE INDIGENT SICK

Treated in the Napa State Asylum for the Insane, for the year ending December 31, 1883.

Total by each Disease.	Diseases.	Number of Deaths by each Disease.
	Consumption	18
	Organic disease of brain	22
	Paralysis	9
	Epilepsy	4
	Exhaustion	19
	General paresis	9
	Maniacal exhaustion	6
	Apoplexy	3
	Cerebral congestion	1
	Congestion of lungs	3
	Heart disease	1
	Marasmus	1
	Inanition	1
	General debility	2
	Chronic cystitis	1
	Dropsy	1
	Pulmonary abscess	1
	Peritonitis	1
	Fracture of skull from fall	1
	Ossification of aorta	1
	Old age	2
	Suicide	3
	Total deaths	110

Remaining under treatment December 31, 1883	1,284
Died	110
Discharged	313
Discharged cured	132
Total admitted	510
Total on hand at commencement of year	1,197
Number of months reported	12

Name and location of hospital: Napa State Asylum for the Insane, Napa City, California.
Physician's name and Post Office address: E. T. Wilkins, M.D., Napa City, California.

REPORT TO THE STATE BOARD OF HEALTH OF THE INDIGENT SICK

Treated in the State Insane Asylum, at Stockton, Cal., for the year ending December 31, 1883.

Total by each Disease.	Diseases.	Number of Deaths by each Disease.
	Consumption	21
	Paralysis	15
	Marasmus	6
	Organic disease of brain	6
	Senile decay	5
	Epilepsy	4
	Maniacal exhaustion	4
	Apoplexy	3
	Chronic hepatitis	3
	Exhaustion from acute melancholia	2
	Valvular disease of heart	2
	Pneumonia	2
	Typho-malarial fever	2
	Scrofulosis	1
	General paresis	1
	Erysipelas	1
	Cancer	1
	Congestion of lungs	1
	Catalepsy	1
	Cirrhosis of liver	1
	Tabes mesenterica	1
	Typhoid fever	1
	Rheumatism	1
	Uterine carcinoma	1
	Acute delirious mania	1
	Enteritis	1
	Heart disease	1
	Atrophy	1
	Suicide	1
	Injuries received before admission	1
	Dropsy	3
	Total	95

Remaining under treatment	1,206
Died	95
Percentage of deaths	7.23
Discharged and eloped	113
Discharged cured	90
Total admitted	275
Total on hand at commencement of year	1,139
Number of months reported	12

All the patients are admitted as suffering under some form of mental disease, classified as follows: Mania, monomania, dementia, melancholia, and idiocy.

For information respecting condition, location, sewerage, ventilation, supplies, medical attendance, surface area to each patient, length of time occupied, water supply, etc., see Superintendent's biennial reports.

Name and location of hospital: State Insane Asylum, Stockton, California.

Physician's name and Post Office address: W. T. Browne, M.D., Medical Superintendent, Stockton, Cal.

REPORT TO THE STATE BOARD OF HEALTH OF THE INDIGENT SICK

Treated in the Shasta County Hospital for the year ending July 1, 1883.

Total by each Disease.	Diseases.	Number of Deaths by each Disease.
10	Alcoholism	1
3	Ulcers, leg	
1	Mastoid abscess	1
1	Typhoid fever	
1	Tertiary syphilis	
13	Rheumatism, chronic	
2	Heart, val. disease	1
1	Senile gangrene	1
1	Hepatitis	
1	Rheumatism, acute	
1	Nymphomania	
2	Eczema	
11	Bronchitis	1
4	Dysentery	
2	Total blindness	
1	Cystitis	
4	Tuberculosis pul.	1
2	Constipation, obstinate	
1	Enteric fever	1
1	Colitis	
2	Fracture, leg	
1	Wound	
1	Orchitis	
2	Hemorrhoids	
1	Cataract, double	
6	Paralysis	2
2	Vertigo	
1	Dropsy, gen.	
1	Dislocation, ankle	
3	Debility (old age)	
4	Diarrhœa, chronic	
1	Boils	
7	Fever, malaria, from the valley	
1	Locomotor ataxia	
2	Dyspepsia	
1	Fracture, arm	
3	Cancer, stomach	3
4	Epithelioma (lower lip)	
1	Dermatitis (poison oak, cause)	
1	Nephritis	

Remaining under treatment	24
Died	14
Discharged	49
Discharged cured	28
Total admitted	93
Total on hand at commencement of year	35
Number of months reported	12

Physician's name and Post Office address: J. M. Briceland, Shasta, California.

SHASTA COUNTY HOSPITAL.

The hospital buildings are located three fourths of a mile west of the Court House. The site is sufficiently elevated to give excellent drainage in any direction from the building. Four buildings on the site, two for the patients, one for steward's residence, one for post mortem examinations. Each is distant from the other about one hundred and fifty feet. All sunny exposure and well ventilated. Belonging to the grounds is a garden which produces vegetables and fruits sufficient for the inmates. Pure cold water supplied from well. Thirty patients can be comfortably provided for, but during the Summer and Fall the rooms are overcrowded with patients coming from the valley, where intermittent and remittent fevers prevail. The institution is supported by a hospital tax of two dollars upon all adult male citizens and Chinamen, consequently the privileges of the hospital are open to all.

J. M. BRICELAND.

REPORT TO THE STATE BOARD OF HEALTH OF THE INDIGENT SICK

Treated in the Humboldt County Hospital, for the year ending October 31, 1883.

Total by each Disease.	Diseases.	Number of Deaths by each Disease.
-------	Consumption	5
-------	Old age	1
-------	Rheumatism	1
-------	Alcoholism	1
-------	Heart disease	1
-------	Dropsy	1
-------	Occlusion of bones	1

Remaining under treatment	19
Percentage of deaths	9
Died	11
Discharged cured	52
Total admitted	62
Total on hand at commencement of year	20
Number of months reported	12

Name and location of hospital: Eureka County Hospital, Eureka.

Physician's name and Post Office address: Thos. Graham, M.D., Eureka, Humboldt County, California.

HUMBOLDT COUNTY HOSPITAL.

The hospital is in good condition; is situated one mile southeast of Eureka; sewerage and ventilation good; the medicine and clothes are furnished by the county—the provisions by the Superintendent. The Physician visits the hospital once every day. There are two good wells. Hospital has been occupied ten years.

JAMES GILL, Superintendent.

REPORT TO THE STATE BOARD OF HEALTH OF THE INDIGENT SICK

Treated in the Santa Cruz County Hospital, for the year ending December, 1883.

Total by each Disease.	Diseases.	Number of Deaths by each Disease.
2	Varicose ulcer	
6	Old age	4
2	Blind	
1	Necrosis of bone	
8	Indigent children (no disease)	
1	Asthma and bronchitis	
2	Paralysis	
2	Fracture of thigh bone	
1	Fracture of skull	1
2	Pneumonia	1
2	Stricture of urethra	
4	Rheumatism	1
4	Alcoholism	1
1	Opium smoker	
6	Abrasions, contusions, etc.	
1	Abscess of lung	
1	Amputation of hand	
3	Consumption	
2	Pulmonary hemorrhage	
1	Intermittent fever	
1	Neuralgia	
1	Childbirth	
2	Supurating inguinal glands	
1	Syphilis (secondary)	
2	Sciatica	
1	Gunshot wound of thigh	
1	Erysipelas	
1	Insane	
2	Cirrosis of liver	2
1	Chronic diarrhœa	
2	No diagnosis made	

Remaining under treatment	19
Percentage of deaths	13
Died	10
Discharged	38
Discharged cured	No record kept
Total admitted	51
Total on hand at commencement of year	16
Number of months reported	12

Name and location of hospital: Santa Cruz County Hospital, Santa Cruz, California.
Physician's name and Post Office address: Benjamin Knight, Santa Cruz, California.

REP[illegible] THE STATE BOARD OF HEALTH OF THE [illegible]

[illegible] at the Sonoma County Hospital, for the year ending December [illegible]

[illegible]	Diseases.	[illegible]
[illegible]	[illegible]	[illegible]

[illegible]

REPORT TO THE STATE BOARD OF HEALTH OF THE INDIGENT SICK

Treated in the San Bernardino Hospital for the year ending December 31, 1883.

Total by each Disease.	Diseases.	Number of Deaths by each Disease.
8	Paralysis	1
1	Bright's disease	
3	Asthma	
6	Consumption	3
6	Rheumatism	
1	Vegetations	
5	Syphilis	2
7	Fever	
1	Fracture	
3	General debility	1
3	Old age	
1	Ulcers	
1	Wounded in shoulder	
1	Burned leg	
1	Ulcer on foot	
1	Wound in hand	
1	Gunshot wound	

Remaining under treatment	16
Died	7
Discharged	25
Discharged cured	25
Total admitted	29
Total on hand at commencement of year	21
Number of months reported	12

Name and location of hospital: San Bernardino, San Bernardino County, California.

Physician's name and Post Office address: J. C. Peacock, San Bernardino, San Bernardino County, California.

The hospital is not as it should be. It is the best can be done now. We are about building a new hospital, when the place will be got up in good shape.

J. C. PEACOCK, County Physician.

REPORT TO THE STATE BOARD OF HEALTH OF THE INDIGENT SICK

Treated in the Santa Barbara County Hospital, for the year ending December 31, 1883.

Total by each Disease.	Diseases.	Number of Deaths by each Disease.
1	Acute bronchitis	
8	Phthisis pulmonalis	5
1	Intermittent fever	
1	Typhoid fever	
1	Chronic rheumatism	
1	Fistula in ano	
2	Septicæmia	2
2	Syphilis	

One admitted for confinement in woman's ward. Mother and child discharged well.

Remaining under treatment	5
Died	7
Discharged	3
Discharged cured	6
Total admitted	18

Total on hand at commencement of year	3
Number of months reported	12

Name and location of hospital: Santa Barbara County Hospital, Santa Barbara, California.
Physician's name and Post Office address: S. B. P. Knox, M.D., Santa Barbara, California.

REPORT TO THE STATE BOARD OF HEALTH OF THE INDIGENT SICK

Treated in the El Dorado County Hospital, for the year ending December 30, 1883.

Total by each Disease.	Diseases.	Number of Deaths by each Disease.
6	Debility from age	4
2	Cancer	1
8	Paralysis	1
2	Delirium tremens	
2	Apoplexy	2
2	Dislocated hip	
7	Incontinence of urine	2
2	Indigestion	1
5	Rheumatism	1
3	Intermittent fever	3

Remaining under treatment	56
Died	17
Discharged	59
Discharged cured	59
Total admitted	63
Total on hand at commencement of year	46
Number of months reported	12

Name and location of hospital: El Dorado County Hospital, Placerville, California.
Physician's name and Post Office address: H. W. A. Worthen, M.D., Placerville, California.

EL DORADO COUNTY HOSPITAL.

This hospital is built on an eminence sloping westward, making it pleasant and airy. The grounds are mostly planted in fruits of the best varieties and all other vegetables necessary for the use of the inmates are grown on the grounds in abundance. The water is brought from the south fork of the American River by means of a ditch, this alone for irrigation. There is a fine well of water, supplying the house and kitchen, for drinking and other purposes. The drainage is good, passing off to the creek below. The area to each patient is not more than ten feet square. The time occupied by the medical attendant each day is from three to four hours. All the surroundings of this institution are excellent.

H. W. A. WORTHEN.

REPORT TO THE STATE BOARD OF HEALTH OF THE INDIGENT SICK

Treated in the Fresno County Hospital, for the year ending December 31, 1883.

Total by each Disease.	Diseases.	Number of Deaths by each Disease.
8	Chronic alcoholism	2
5	Pneumonia	
1	Hip joint disease	
17	Rheumatism	
1	Epilepsy	
4	Dropsy	2
5	Consumption	3
3	Gunshot wounds	
13	Syphilis	
1	Erysipelas	
2	Contused wounds	
1	Blind	
1	Carbuncle	
16	Bronchitis	1
3	Paralysis	
2	Arm fracture	
3	Leg fracture	
1	Ribs fracture	
5	Railroad injuries	1
10	Chronic gastritis	
2	Diarrhœa	
10	Intermittent fever	
5	Remittent fever	
6	Typhoid fever	1
4	Heart disease	2
1	Dislocation	
3	Incised wounds	
1	Aneurism right carotid	1
1	Sunstroke	
3	Enteritis	
2	Dysentery	
1	Cystitis	

Remaining under treatment	16
Percentage of deaths	$9\frac{10}{47}$
Died	13
Discharged	15
Discharged cured	97
Total admitted	122
Total on hand at commencement of year	19
Number of months reported	12

Name and location of hospital: Fresno County Hospital, Fresno.
Physician's name and Post Office address: Lewis Leach, Fresno, Fresno County, California.

Please see former report respecting condition, location, sewerage, ventilation, supplies, medical attendance, surface area to each patient, length of time occupied, water supply, etc.

Respectfully,

LEWIS LEACH, M.D.

REPORT OF THE STATE BOARD OF HEALTH OF THE [illegible]

Treated in the Tehama County Hospital, for the year ending December 31, 19[illegible]

Total to each Number	Diseases	Number of Deaths in each Disease
[illegible]	[illegible]	
[illegible]	[illegible]	
[illegible]	[illegible]	
[illegible]	[illegible]	
[illegible]	[illegible]	
6	[illegible]	
2	[illegible]	2
1	[illegible]	
2	[illegible]	2
1	[illegible]	
2	[illegible]	
[illegible]	[illegible]	
2	[illegible]	2
2	[illegible]	
2	[illegible]	
2	[illegible]	
2	[illegible]	
2	[illegible]	
2	[illegible]	
1	[illegible]	
2	[illegible]	
4	[illegible]	
2	[illegible]	
1	[illegible]	
1	[illegible]	
2	[illegible]	
2	[illegible]	
14	[illegible]	
1	[illegible]	
2	[illegible]	
1	[illegible]	
1	[illegible]	
4	[illegible]	
4	[illegible]	

Remaining under treatment	21
Percentage of deaths	7.09
Died	10
Total Admissions	99
Discharged cured	67
Total admitted	109
Total on hand at commencement of year	21
Number of months reported	12

Name and location of hospital: Tehama County Hospital, Red Bluff, California.
Physician's name and Post Office address: John Fisk, Red Bluff, California.

REPORT TO THE STATE BOARD OF HEALTH OF THE INDIGENT SICK

Treated in the Nevada County Hospital, for the two years ending December 30, 1883.

Total by each Disease.	Diseases.	Number of Deaths by each Disease.
3	Typhoid fever	2
4	Bronchitis	2
5	Phthisis	4
8	Pneumonia	4
34	Rheumatism	3
5	Intermittent fever	4
2	Gangrene	2
1	Softening of brain	1
1	Ascites	1
5	Erysipelas	2
2	Cancer	1
16	Paralysis	5
1	Pyæmia	1
1	Disease of heart	1
11	Syphilis	2
2	Nephritis	1
2	Apoplexy	2
2	Diabetis menitis	1
1	Alcoholism	1
1	Suicidal	1
2	Unknown	2

Remaining under treatment	56
Percentage of deaths	15
Died	43
Discharged	112
Discharged cured	76
Total admitted	235
Total on hand at commencement of year	52
Number of months reported	24

Name and location of hospital: Nevada County Hospital, Nevada City, California.
Physician's name and Post Office address: R. M. Hunt, M.D., Nevada City, California.

THE SANITARY DRAINAGE OF SACRAMENTO.

With remarks by the Secretary of State Board.

ACTION AND REPORT OF THE COMMITTEE OF THE CITIZENS' ASSOCIATION.

In Sacramento is an association of citizen taxpayers organized solely for the purpose of discussing, investigating, and advising upon the local social and material questions of the municipality. In February of the present year, a committee of this association, after having held a number of meetings, and having considered the question as it would appear quite fully, made a report to the association on the subject of the sewerage of th posal of the sewage.

The points in rmulated in twenty-three concise conclusions and progressively arranged, and covering the whole y drainage question as presented

REPORT OF DEATHS,

Arranged according to Diseases, Sexes, Ages, and Nativities, from January 1 to December 31, 1882.

Causes of Death.	Total	Sexes.			Ages.										Nativities.			
		Male	Female	Unascertained	Under 1 year	1 and under 5 years	5 and under 10 years	10 and under 20 years	20 and under 30 years	30 and under 40 years	40 and under 50 years	50 and under 60 years	60 and under 100 years	Unascertained	Pacific States	Atlantic States	Foreign Countries	Unascertained
I.—Zymotic, or Epidemic.																		
Cholera																		
Cholera morbus	10	4	4	1					2	2	3	1	1		3	2	4	
Cholera infantum	140	67	65		107	23	1			1					127	1	4	
Diarrhœa	72	31	22	1	31	9			1	4	2	2	5		39	9	6	
Dysentery	32	26	6		6	4	2	1	5	3	2	3	6		13	1	15	3
Smallpox	25	16	9		6	5	1	2	5	5		1			12	4	9	
Measles	104	43	48		24	47	10	5	4				1		80	6	5	
Scarlatina	82	37	43	1	14	39	23	5							74	4	3	
Diphtheria	181	86	88		5	76	75	15	1	2					155	15	3	1
Croup	73	35	37	1	16	42	14	1							72		1	
Whooping-cough	40	18	18		18	17	1								26	10		
Erysipelas	30	18	10		5	1		1		2	6	7	6		6	10	12	
Fevers—Typho-malarial	52	27	20		3	4	8	5	9	7	6	2	2	1	18	12	17	
Typhoid	234	131	88	1	1	15	23	45	58	31	26	7	12	2	86	58	76	
Remittent and intermittent	46	21	22		5	8	7	6	4	3	2	5	3		20	11	10	2
Cerebro-spinal	65	32	29		12	22	6	5	7	5	2	1		1	44	10	7	
Syphilis	30	18	12		6	2	1		6	8	5	1	1		11	6	13	
Alcoholism (direct or remote), including delirium tremens	78	61	10	1					5	21	23	17	6		2	23	41	6
II.—Constitutional Diseases.																		
Hydrocephalus	19	9	10		9	10									18		1	
Tubercular meningitis	45	19	16	3	12	43	4	4		2	2			1	29	5	4	
Phthisis pulmonalis	1,189	765	374	12	19	17	10	86	274	334	223	134	52	2	197	288	652	14
Marasmus	316	175	140	1	249	31	6	1	11	6	3	5	4		282	9	24	1

Scrofula	10	7	3	----	4	3	1	2	-----	-----	-----	-----	-----	-----	8	2	-----	----
Rheumatism	26	20	6	----	1	2	-----	2	2	3	6	6	3	1	6	3	17	----
Cancer	107	93	99	----	-----	3	-----	1	6	23	48	66	44	1	10	58	123	1
III [illegible]																		
[illegible]	780	404	387	----	92	152	44	29	96	103	83	66	73	3	309	120	304	8
[illegible]	7	4	3	----	1	1	-----	-----	1	1	1	-----	1	-----	2	-----	4	----
[illegible]	305	134	77	1	46	49	8	-----	7	25	27	17	22	1	99	21	82	----
[illegible]	100	56	44	----	27	13	4	-----	10	9	16	7	14	1	45	19	36	----
[illegible]	90	67	23	----	13	9	-----	3	6	20	11	7	19	2	29	16	44	1
[illegible]	100	58	51	----	39	21	1	5	7	10	12	4	10	----	61	16	32	----
[illegible]	78	44	34	----	16	8	3	3	13	15	6	9	5	----	30	9	38	1
[illegible]	37	17	20	----	14	5	2	2	1	4	-----	5	4	-----	23	3	11	----
[illegible]	94	38	56	1	4	1	1	10	15	23	11	8	7	-----	18	16	46	----
[illegible]	135	92	43	1	2	3	-----	5	7	23	37	38	23	-----	14	36	87	1
[illegible]	71	43	28	----	14	10	1	1	8	10	9	6	10	2	27	20	23	1
[illegible]	85	63	22	----	2	1	6	2	13	14	15	19	21	-----	15	28	49	1
[illegible]	53	49	4	----	----	----	----	-----	1	13	20	16	4	-----	1	17	36	----
[illegible]	572	344	228	1	38	4	7	18	30	46	73	78	87	-----	65	91	215	2
[illegible]	309	164	145	----	145	34	2	-----	1	-----	1	5	2	1	193	5	11	----
[illegible]	432	364	68	2	74	97	44	17	26	64	80	79	104	2	213	135	233	8
V [illegible]																		
[illegible]	40	----	40	----	-----	----	-----	5	23	9	8	1	-----	-----	15	12	16	1
[illegible]	134	36	98	----	-----	----	-----	-----	-----	-----	2	1	132	-----	10	36	82	4
VI [illegible]																		
[illegible]	74	74	0	----	-----	----	-----	3	19	22	16	19	8	-----	4	24	42	7
[illegible]	----	----	----	----	----	----	----	----	----	----	----	----	1	----	----	1	----	----
[illegible]	2,[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-----	----	-----	-----	-----	-----	-----	-----	-----	-----	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

REPORT OF DEATHS,

Arranged according to Diseases, Sexes, Ages, and Nativities, from January 1 to December 31, 1883.

Causes of Death.	Total.	Sexes.			Ages.										Nativities.			
		Male.	Female.	Unascertained.	Under 1 year.	1 and under 5 years.	5 and under 10 years.	10 and under 20 years.	20 and under 30 years.	30 and under 40 years.	40 and under 50 years.	50 and under 60 years.	60 and under 100 years.	Unascertained.	Pacific States.	Atlantic States.	Foreign Countries.	Unascertained.
I.—Zymotic or Epidemic.																		
Cholera morbus	10	6	3	------	4	1	------	------	------	------	------	1	3	------	4	3	2	----
Cholera infantum	172	70	68	------	113	22	2	1	------	------	------	------	------	------	133	1	4	----
Diarrhœa	83	34	27	------	33	2	------	1	3	1	9	6	6	------	27	11	18	5
Dysentery	28	18	10	------	9	4	------	1	2	2	3	1	6	------	19	2	6	1
Smallpox	10	1	------	------	------	------	------	------	------	------	------	------	1	------	------	------	1	----
Varicella	1	1	------	------	1	------	------	------	------	------	------	------	------	------	1	------	------	----
Measles	8	3	3	------	3	1	2	------	------	------	------	------	------	------	6	------	------	----
Scarlatina	27	14	9	------	2	14	4	1	------	2	------	------	------	------	17	6	------	----
Diphtheria	134	59	65	------	8	53	37	24	2	------	------	------	------	------	112	10	2	----
Croup	38	24	11	------	7	19	8	1	------	------	------	------	------	------	34	1	------	----
Whooping-cough	46	16	22	------	24	14	------	------	------	------	------	------	------	------	38	------	------	----
Erysipelas	28	19	6	------	3	2	1	1	1	1	8	6	2	------	8	7	9	1
Fevers—Typho-malarial	31	18	9	------	------	2	1	5	5	6	4	2	2	------	7	10	10	----
Typhoid	247	123	102	4	3	13	25	39	53	38	24	18	14	2	85	48	90	6
Yellow	3	3	------	------	------	------	------	------	1	1	1	------	------	------	------	------	1	2
Remittent and intermittent.	27	15	10	------	2	1	2	1	5	4	3	2	5	------	4	9	10	2
Cerebro-spinal	39	14	16	------	11	4	4	7	2	1	1	------	------	------	22	5	3	----
Syphilis	17	12	5	------	3	1	------	1	3	6	------	------	3	------	4	2	10	1
Alcoholism (direct or remote), including delirium tremens	83	47	18	------	------	------	------	------	8	14	18	20	5	------	6	26	31	2
II.—Constitutional Diseases.																		
Hydrocephalus	32	13	19	------	14	16	------	1	1	------	------	------	------	------	28	------	4	----
Tubercular meningitis	31	13	10	------	3	14	3	1	------	1	1	------	------	------	18	2	3	----
Phthisis pulmonalis	1,320	821	422	21	3	16	8	66	277	361	275	172	75	11	179	314	737	34
Marasmus	239	130	109	------	188	15	4	3	3	7	7	2	10	------	197	8	30	4

Scrofula	19	13	6	------	3	1	3	1	1	8	1	------	1	------	7	1	10	1
Rheumatism	24	15	9	------	------	1	1	3	2	2	4	3	8	------	5	7	12	----
Cancer	219	87	123	------	------	1	------	------	3	30	53	68	55	------	3	73	130	4
III.—Local Diseases.																		
Pneumonia	596	378	172	------	67	66	12	24	47	86	93	65	85	5	171	99	279	1
Pleurisy	15	12	2	------	1	1	1	------	1	2	2	4	2	------	3	4	7	----
Bronchitis	143	75	65	------	29	17	3	3	5	10	16	20	37	------	45	23	69	3
Congestion of lungs	66	38	25	------	18	3	1	------	5	6	10	5	15	------	20	11	32	----
Other diseases of respiratory organs.	102	74	28	------	8	5	1	3	12	22	14	18	19	------	24	18	58	2
Enteritis	176	97	79	------	111	21	2	5	6	8	4	8	11	------	135	14	25	2
Gastritis	65	37	28	------	12	3	------	2	8	11	17	9	3	------	16	7	41	1
Gastro-enteritis	45	18	25	2	15	5	------	------	3	3	7	6	6	------	20	4	20	1
Peritonitis (non-puerperal)	70	30	40	------	3	1	1	8	9	16	11	9	12	------	13	19	37	1
Diseases of the liver	140	100	40	------	13	1	2	3	12	20	24	33	32	------	27	33	77	3
Other diseases stomach and bowels.	97	63	33	1	16	6	4	6	9	7	23	11	15	------	33	21	42	1
Bright's disease and nephritis	99	67	32	------	2	3	------	4	13	22	17	15	21	2	14	35	46	4
Aneurism	52	42	8	------	------	------	------	------	1	13	16	9	9	2	1	11	37	1
Heart disease	398	254	115	------	16	2	6	20	27	43	90	74	90	1	44	114	208	3
Convulsions	235	116	117	2	182	43	8	1	------	1	------	------	------	------	228	3	3	1
Other diseases of brain and nervous system	633	399	234	------	96	65	31	27	32	41	90	96	149	6	221	150	248	14
IV.—Developmental Diseases.																		
Puerperal diseases	52	1	51	------	1	------	------	8	25	12	4	1	1	------	12	12	28	----
Old age	148	78	69	1	------	------	------	------	------	------	------	------	148	------	4	41	98	5
V.—External Causes.																		
Suicide	98	88	9	1	------	------	------	------	23	28	19	15	12	1	5	15	72	6
Heat, death from—sunstroke	1	1	------	------	------	------	------	------	1	------	------	------	------	------	------	------	1	----
All other causes not classified	1,062	655	244	14	191	39	20	57	114	125	100	127	107	33	292	179	387	55
Stillbirths	307	166	85	56	------	------	------	------	------	------	------	------	------	------	------	------	------	----
Reports by postal cards	------	243	147	63	------	------	------	------	------	------	------	------	------	453	181	135	105	32
Totals	7,209	4,455	2,645	109	1,218	498	197	329	725	961	969	827	969	516	2,473	1,494	3,043	199

APPENDIX.

The Board of Health, while generally approving the papers presented in this report, are not responsible for the particular sentiments expressed.

BOARD OF HEALTH.

IRRIGATION—ITS INFLUENCE ON HEALTH, ETC.

By H. S. Orme, M.D., Member State Board of Health.

The question of the effect of the irrigation of agricultural lands, particularly in California, upon public health, is one of growing importance, and inasmuch as the available evidence bearing upon the subject is somewhat contradictory, it is necessary to note the conditions of locality, with respect to soil, temperature, humidity, and drainage, wherever irrigation is practiced.

Although irrigation has been carried on in California since the first establishment of the early missions by the Franciscan Fathers, more than a century ago, very little progress has been made in the scientific application of the system, the object of the cultivator being apparently only to get the water upon his land, without regard to the method employed.

The application of the water used in irrigation varies greatly in manner, but may be described as two different methods, viz.: first, by flooding the whole surface of the land from open (*zanjas*) ditches; and second, by sub-irrigation—that is, a conveyance of the water through pipes beneath the surface of the ground, which have openings at intervals protected by upright pipes.

So far as the effect on health is concerned, the latter method will not be considered, because of the very limited extent to which sub-irrigation is being applied.

In the case of the application of water by *flooding* the land from open ditches, the various reports, though made by impartial authorities, are in some respects conflicting. For instance, in Los Angeles, Ventura, Santa Barbara, San Bernardino, and San Diego Counties, where irrigation has been carried on for over a hundred years, the testimony is strong to the point that there is no striking difference in the amount of malarial diseases, whether irrigation is practiced or not. On the other hand, if we consult the records of some other portions of California, we find an increase of malarial fevers with the increase of irrigation, too intimately connected to be overlooked. The reasons for this are not difficult to discover. In the Los Angeles and other valleys in extreme southern California, where the soil is, as a rule, sandy or gravelly loam of unknown depth, the water used in irrigation either sinks into the ground, or, if there is much surface slope, immediately drains off. The soil does not remain saturated unless there is a stratum of clay (hard-pan) at or near to the surface. In such sections of country there is great freedom from malarial diseases. Along the bottom lands of rivers where the slope is insufficient to insure good drainage, or where the soil is constantly saturated, the case is different. Here there is more or less intermittent and remittent fever during the warmer season of the year. In the case of swamp or overflowed lands, especially those having a heavy adobe soil, as well as those which rema[illegible]y from the Winter rains, and are in Summer kept i[illegible]lition

by artificial means, containing also an excess of decomposing vegetable matter and many stagnant pools, malarial diseases of the most pronounced type are very prevalent. In such localities all zymotic diseases are much worse in Summer than in Winter—a consequence which naturally results from the high temperature and increased evaporation. The fact that the people living in these low, wet, adobe sections of country are dependent upon impure or surface water for drinking and domestic purposes, greatly aggravates the difficulty. Indeed, it has been more than once demonstrated that people living in a "fever and ague" country are tolerably exempt from the fever if they drink only pure water.

Concerning this view of the subject I make use of a report made in May, 1884, by Will S. Green, editor of the *Colusa Sun*, to the State Irrigation Convention. He states, in substance, as follows:

During a residence of thirty-four years in the Sacramento Valley I have had an opportunity to observe the effects of irrigation on health, and have been led to reject the theory of infection by malaria in the atmosphere. All along the margins of the tules people are living, some of whom are attacked by chills, while the occupants of other adjacent places are never so attacked. All these people breathe the same air, coming to them from the same hot stagnant water and decaying vegetation.

There are clay or hard-pan banks to the Upper Sacramento River, which are from a quarter of a mile to a mile apart. There is, in consequence of the action of the river current, a clay formation, and a new alluvial formation. I began to notice that those people who built their houses and *dug their wells* on a newer formation generally had chills, while the others, as a rule, had none. Sometimes these sickly and healthy places would be but a few feet apart. They all breathed the same air, but they *did not drink the same water*. The town of Colusa is built upon the old clay formation, and the inhabitants are almost entirely free from chills, typhoid fever, diphtheria, etc., but just at the lower end of the town there is a new formation, and upon this an extension to the town was located; and among other buildings the County Hospital was placed there. The patients and employés of the hospital all had chills for several years, until the physician in charge, Dr. W. H. Belton, noticed that the people generally who used water from wells on this newly-made land had chills, while the others had not, and caused pipes from the town waterworks, into which river water was pumped, to be laid to the hospital. There was an *immediate* change. At the commencement of the use of river water there were some forty persons in the hospital, all with chills, but since the building has been almost entirely free from it. There could be no more conclusive evidence that these people *drank* the germ of the disease, and *did not breathe it*.

It is claimed that after a wet season there is more malaria in the air, and that hence people are more subject to disease. I have investigated this, and my observations, extending over a number of years, have convinced me that the water in the wells is simply raised to a newer strata—one not thoroughly washed, as it were, and that people there drink the germ of disease, and do not breathe it.

My conclusions are, therefore, that irrigation will tend to bring on malarial disorders, as it raises the water in wells to a newer strata of earth, but no farther. When we irrigate so as to produce this effect we must *go down* after pure drinking water, or bring it to our houses in pipes. * * * *

In some localities, where the air is not in motion every day, as it is here, the air, like standing water, may become stagnant. I know of some hotels in this valley totally void of drainage, and where the accumulated filth of a quarter of a century stands in the yards in cesspools. In some countries this would kill ninety out of a hundred people who would stop in them a week, but here we feel no inconvenience from it, except in so far that the water may become impregnated. Air in motion, like water in motion, purifies itself, and hence I have come to the rejection of the theory of malaria in the air.

The same gentleman, writing further on this subject, under date of July 14, 1884, remarks:

Stony Creek runs into the river through the plains. It once had its mouth below its present one, and has worked north. On the land that the creek has thus made there are settlers. Some of them have chills. At other places no such thing is known. Just off the made land, there are no chills. There is, apparently, nothing to make a difference—no tree, no shrub of any kind—all an open plain, with the wind blowing from the south or north every day. Some of these people get water in a soil mixed with vegetable mold, rotted so as to appear to be all but in reality it still retains the parasite of the chills called malaria, while the others

get water not so impregnated. This is a large extent of country—some eighteen miles by three—and it gives the inquirer a good opportunity to make a rule.

The hospital case, however, mentioned in my letter to the Riverside State Convention, is the most conclusive, and for this we have the evidence of Dr. Belton. He indorses my theory.

Further on I shall append to my own remarks quotations from correspondence addressed to me on this subject.

In many instances where diseases are attributed to malarial influences, I am convinced, in addition to the one of impure water for drinking purposes, that a serious cause of evil lies in the habitual disregard of all sanitary laws by the people. Improper food and clothing, reckless exposure, and personal uncleanliness, will dispose to diseases closely allied to those charged to malaria, and such conditions are too often found among the lower class of our people.

Without discussing the germ theory, as applied to zymotic diseases, it may safely be said that the application of water to the soil during hot weather, has the effect of developing into activity many forms of organic germs, including minute algæ, confervoids, diatoms, bacteria, etc.

The germ spores of these organisms require both heat and moisture for their full development. Until then, they remain in a passive condition for weeks, months, and even years; but in the presence of heat and moisture, they develop and become prolific with the most wonderful rapidity.

In substantiation of this a recent Paris medical journal gave the results of a series of investigations continued for eight years into the composition of the Paris atmosphere: "It was found to hold in suspension cotton, hemp, wool, hair, down, pollen, starch, particles of skin, carbon, silex and various salts, iron, dead insects, ova of infusoria, and especially spores of cryptograms and bacteria. The spores vary from three thousand in March to fifty-four thousand in June, and moisture increases their number. The mortality from infectious diseases increases with the number of bacteria."

A microscopist, living in Los Angeles (Professor J. W. Redway), in answer to certain queries, informed me that, after going through an orchard which had been recently irrigated, he always found present, in his saliva, not only those particular species of bacteria which are peculiar to moist soil, but also the spores of that organic growth variously known as green scum, green mold, fever and ague plant, etc. Not only were these found in the mucous secretions, but they were also present in the perspiration.

Fortunately the exceeding dryness of the atmosphere in those sections of our State where irrigation is most generally used, and our daily ocean winds, prove our best safeguards against the dangers of malarial infection, excepting in the few localities where the ground is kept saturated for lengthened periods.

It is barely possible that intermittent and remittent fevers are more prevalent in well drained orchard lands, where irrigation is carried on, than where none is practiced, but it will require long and careful observation and experiment to establish this fully.

The fact, however, that bacteria and other organic growths are more abundant in the neighborhood of irrigated than of dry lands is an important point, and should be studied closely with the aid of microscopic research.

The same dangers arising from irrigation are likewise great in the case of street sprinkling, and is it not possible that some of those

troubles of the throat and nasal passages, so closely resembling "hay fever," are caused by inhaling the dust of the streets, which is always alternating between saturation and dryness.

The prevention of zymotic diseases in irrigated districts has of late received considerable attention. Of the methods employed, the removal of the surface water, and, where possible, the provision for systematic drainage, has been the most successful. For *irrigation in order to be innocuous must go hand in hand with drainage.* This fact has been demonstrated, time after time, by the drainage and cultivation of marshes whose noxious exhalations had previously rendered their vicinity uninhabitable, but which, after drainage and cultivation, became healthy and fertile lands. These results are due to the removal of the superabundant moisture and the conversion of the decomposing organic matter into plant food. It may also be said here that while the dangers from standing water are serious, those arising from running water are in our climate comparatively slight, for has it not been often asserted, and believed by many, that running water, like air, in motion, does much to purify itself.

Where drainage cannot be accomplished, the removal of the products of decomposition by absorptive plants, bids fair to be successful to a large extent. The planting of the helianthus (sunflower) in the Potomac flats, and the culture of rapidly-growing plants in the bayous of Louisiana, have certainly modified the prevalence of fevers in the localities where they have been grown. The planting of the eucalyptus in the Campagna of Italy is a more remarkable case, for there districts which had been wholly depopulated were made not only habitable, but even healthy, by the growth and influence of eucalyptus groves. In parts of California the cultivation of the cinchona tree might be successfully carried out. Not only does the cinchona possess all the virtues of the eucalyptus, but it also commends itself as a source of revenue and profit. In southern California there exists every condition requisite to its successful culture.

By systematic removal of the surface water by drainage, together with the intelligent and careful cultivation of the soil, and the planting of those trees which help to bring about salubrity, it is confidently expected that much good may be looked for in the future.

There is also another imperative necessity, namely, that people must be taught how to live. The study of physiology must include the elements of hygiene, or sanitary science, and the lesson must be taught that sound health can no more exist in the same house with foul water, foul air, and foul persons, than can moral virtue be contained in a phosphoric nimbus of filth. For has it not been truly said: "That the health of the people is really the foundation upon which all their happiness and all their power as a State depends."

The following communications from reliable and prominent physicians, and others, have been received within the past few weeks, in reply to requests for opinions and observations on this subject. They will be read with interest, as showing a remarkable unanimity of opinion to the effect that irrigation, under the conditions of system, soil, and climate that obtain generally throughout this State, has not as yet, especially in southern California, been productive of malarial disease to any such extent as to cause alarm. At the same time it is sufficiently apparent that all those who have the general health of the public at heart should not fail, whenever practicable, to point out

the advantages of thorough systems of land drainage, and the necessity of drinking only pure water:

[From M. M. CHIPMAN, M.D., San Francisco.]

Irrigation produces a tendency to malaria, if carelessly managed, but if the engineering and leveling of the land is such as not to allow the water to stand in stagnant pools, if the ditches are kept properly cleaned out, and if wholesome water, not open ditch water, is provided for domestic uses, the prejudicial effects of irrigation may be nearly, if not altogether averted. And, on the other hand, the increased vegetation, the covering of the surface of the country with orchards, shrubbery, and trees, must lessen and modulate the extremes of Summer heat, and, in that respect, render the climate more tolerable and salubrious. The circumstance should not be overlooked that the air of malarious regions in drifting through forests is purified of its noxious principles, and we may, therefore, anticipate that the development of a considerable tree growth over an irrigated district will have a favorable influence, and especially, by devoting a part of the surface to forest tree culture, giving preference, when practicable, to such varieties of the eucalyptus tree as are adapted to the different localities. And, on the whole, the apprehension of malaria from irrigation should have very little influence with an intelligent people, as compared with the benefits of the enterprise.

[From DR. H. N. RUCKER, Merced.]

In the County of Merced there are only two localities where irrigation is practiced up to the present time. One is on the west side of the San Joaquin and the other on what is known as the "Merced River Bottom." Here, for many years past, portions of the bottom land have been irrigated with water from the river, and form a regular hotbed, so to speak, for malarial diseases. The bottom varies in width from perhaps one to three miles; is bounded on either side by high bluffs, and, in most places, is covered by trees and shrubs. It will thus be seen that the bottom is shielded to a very great extent from the prevailing winds. As far as I have been able to learn, this was a healthy locality till the water of the river was turned out of its proper channel. The soil is a rich black alluvium, and, when watered, produces abundantly. At other points on the river, more or less remote from irrigation, with like conditions, malaria is not present.

In regard to the planting of trees, there seems to be a difference of opinion among those who have given attention to the subject, as to whether the effect is salutary or otherwise. It would seem that in temperate latitudes the cultivation of forest trees would contribute to health by protecting the soil from the rays of the sun, and thus moderating the temperature, besides the consumption of miasmatic exhalation by absorption through the leaves. To the eucalyptus globulus has been attributed especial merits in this particular, for the reason that to their great absorbing power is mainly due the rapidity of their growth. It is claimed for them that they will absorb ten times their weight in water, and that if planted in marshy soil they will dry it up in a short time. According to the *Medical Times and Gazette* of 1873, the English were the first to make experiments with them at the Cape of Good Hope, and it is said that "within two or three years they succeeded in entirely changing the climatic conditions of the unhealthy part of the colony." At Pardock, a town twenty miles from Algiers, situated on the Hamyze, and known for its infected air, were raised in the Spring of 1876, about 13,000 plants of eucalyptus globulus. In July of this year, at which time the fever had in former years usually begun, there was not a case, although the trees were only nine feet high. Since that time the place has maintained a complete immunity from disease.

A farm is spoken of in the neighborhood of Constantine, which was a marsh Summer and Winter, and was made dry in five years by 14,000 trees; the inhabitants enjoying excellent health. Many other instances are also mentioned of the same marvelous success. But flattering as these reports may seem, we are confronted with instances which seem to set at naught both theory and practice in relation to this matter. One particular instance may be mentioned, of a large farm on the open plains in Merced County, which has been under a system of irrigation for a number of years. Quite a dense grove of eucalyptus trees has grown up around the farm-house, and for the past two or three years the effects of malaria have become quite apparent. On other portions of the farm, where farm hands are domiciled, and where quite as much water is used, with an absence of timber, the effects are not noticeable.

In latitudes where the temperature runs high, it has been argued that forests, or the planting of trees, do harm, for there, even in the shade, the temperature is abundantly sufficient for the development of these effluvia "by the material which these trees supply for decomposition, the dampness which they promote, and the impediment which they offer to the diffusion of the poison, far more than they can do good by their consuming power." At a temperature under 60° F. the peculiar morbid effects ascribed to miasm seldom arise, while on the other hand, a temperature of 80° or 85° renders it very active. Experience demonstrates that this activity increases with still further elevations of temperature, for the nearer we approach to the equator the more violent, as a general rule, do we find them, implying a greater intensity of the cause. Throughout the larger portion of the great San Joaquin Valley, where the thermometer ranges from 80° to 110° and more, in the shade, for months, it will not be surprising that, with the other conditions favorable, malarial disease eventually may become a matter of serious moment.

In fact, the essentials to production of miasmatic diseases appear to be heat, moisture, and vegetable decomposition.

[From Judge B. BRUNDAGE, Bakersfield, Kern County.]

In reference to the sanitary effect of irrigation, I settled here in January, 1872. At that time there was but little improvement made in the now irrigated portion of the adjacent country, the land being covered with quite a dense growth of brush, trees, and other vegetation. Numerous sloughs meandered through the valley below the river bluffs, the banks and beds of which were befouled with dense vegetable growths, causing the water to stagnate; the people residing near the sloughs and streams using the water for drinking and other domestic purposes, all of which caused almost universal sickness during the months of June, July, August, and September, from malarial fevers.

Since then the country has rapidly improved, the lands (sloughs and swamps), have been cleared up, the waters taken from the sloughs and river and diverted into large irrigation canals, carrying flowing water, comparatively free from vegetable growths, and used extensively for irrigating purposes. The people have better habitations and use water for drinking purposes from bored wells. Hence the general health of the country has vastly improved, and the doctors complain of its being "distressingly healthy." Although there is annually a large increase of irrigated acreage, yet the general health of the community steadily improves. The clearing and cultivation of the land and the annual cleaning of the canals and irrigating ditches, cause the general health of the people to improve. On the west side of the river, out on the desert plain, where an extensive system of irrigation and cultivation of the soil has been carried on during the past six years, the residents are as healthy as anywhere else in the State. Seven years ago it was a barren plain, now there are farms all along the canal for a distance of twenty-six miles, producing large crops annually by means of irrigation, and no sickness occasioned by it to my knowledge.

[From W. M. MCFADDEN, Anaheim.]

I have resided in a district in Los Angeles County nearly sixteen years, in which, for the last seven years only, the whole district has been under irrigation supplied from a ditch, which was constructed for the purpose. I have had excellent opportunities for observing the effects of irrigation upon the health of the people within the irrigated district. I have noticed no change effected by irrigation. The health of the people is good. No malaria, epidemics, fevers, or rheumatism. There are no stagnant pools, nor decayed vegetable matter, as the dryness of the climate evaporates all superfluous water and cures or matures all vegetable growth. In as dry a country as southern California, I am satisfied that irrigation does not affect the health of the community.

[From Capt. J. Q. A. STANLEY, Los Angeles.]

I can state, from personal knowledge and experience of over thirty years, that I have never known of any cases of malarial fevers, or other diseases, caused by irrigation in Los Angeles County, and I am satisfied, that under ordinary circumstances, and with a proper regard to the rules of health, there is nothing in connection with irrigation that would necessarily produce disease.

[From Dr. W. R. FOX, San Bernardino.]

In regard to the production of malaria by irrigation I would say, that during the ten years I have practiced medicine in San Bernardino and vicinity, I have seen a few cases of mild malarial fever that I attributed to the action of water and heat upon recently disturbed virgin soil. I do not think that sufficient irrigation, with proper cultivation, upon well drained land, will produce malaria to any appreciable extent, especially when there is a daily trade wind during the season of irrigation.

[From Dr. A. H. WOODILL, Riverside, San Bernardino County.]

I have to say, as the result of my own observation and from information from others, that irrigation does not produce malaria in this part of the State. Not one case of well marked disease, of malarial origin, has ever occurred here. In fact, we have no endemic disease of any kind at Riverside. Irrigation, therefore, has no injurious influence on the public health. We have had some few cases of fever of a mild character, lasting from two to three weeks.

We have had a few cases, certainly not more than six, of typhoid, in a year, that originated here.

All of these cases, undoubtedly had their origin in local insanitary conditions, and occurred for the most part in the more thickly settled portions of the town proper.

Many cases of typhoid fever, well developed, have come from abroad. We get the credit of these, hence the report that fever was epidemic at Riverside.

We certainly have heat enough to promote fever, and in some places plenty of moisture, but the "materies morbi" is wanting. The Santa Ana River runs on the windward side of the
r throughout its whole length.
alaria originated from it, it would be blown directly upon the settlement. People live

along its banks, and there has never been a case of malarial fever. Our water ditches run through the entire valley, and they are all open ditches. The soil through which they pass is completely soaked at times, and, other things being equal, offer favorable conditions for fever.

I am satisfied that if the common sanitary precautions were strictly practiced by the people, that all cases of fever would be prevented.

The worst being said, I am still of the opinion that this is one of the most healthy communities in California. Our cool nights induce sleep, which precludes the possibility of much or any miasmatic disease.

As regards the benefit to be derived from tree-planting on the rainfall, I will say, however popular the idea may be, I have failed to recognize any good to be derived from it. The illimitable vastness of the plains is such that it would require many years of planting to produce any visible effect. I think, also, that the influences that bring about increased rainfall, do little good in this valley, even if every inch were planted in trees, because of the everlasting hills.

[From Dr. F. S. HILLARD, San Gabriel, Los Angeles County.]

The July number of the *Zeitschrift*, edited by Professor Klebs, contains some particulars of an investigation into the physical cause or poison to which marsh or intermittent fever is due. The inquiry was conducted by Professor Klebs, of Prague, in conjunction with Signor Tommasi, Professor of Pathological Anatomy, at Rome. The two investigators spent several weeks during the Spring season in the Agro Romano, which is notorious for the prevalence of this particular kind of fever. They examined minutely the lower strata of the atmosphere of the district in question, as well as its soil and stagnant waters, and in the two former they discovered a microscopic fungus, consisting of numerous movable shining spores of a longish oval shape. The fungus was found capable of being artificially generated in various kinds of soil. The fluid matter obtained was filtrated and repeatedly washed, and the residuum left was introduced under the skin of healthy dogs. The animals experimented on all had the fever with the regular typical course. After explaining minutely the results of their various investigations and experiments, these gentlemen are of the opinion that they have discovered the real cause of the disease in question. As the fungus grows into the shape of small rods, Tommasi and Klebs have given it the name of Bacillus Malarial.—[*Medical Times and Gazette*, October 18, 1874.

If the fact of the existence of a fungus, the so called Bacillus Malarial, is accepted as proved, it would explain much that hitherto has been mysterious in the nature of malaria. Why is it traveling and infesting districts hitherto free from it? If it is due to a distinct bacillus, the answer is now simple, for unless one accepts the doctrine of spontaneous generation, he must have a parent for his child. He must have bacilli to produce bacilli. Moisture and decaying vegetation alone are not enough, the bacilli must be present. If our premises are correct, our conclusion is as certain as in the case of variola or scarlatina.

Hence, irrigation is perfectly safe, provided the soil was originally free from malaria, and the water put upon it is also free from it.

My own observation here, in southern California, leads me to believe that cases of malarial poisoning which have occurred, were imported. I have seen nothing yet to cause alarm as to the evil effects of irrigation on health—granted that the air and soil are free from all miasms, we have only to examine the water, and if that also is free, malaria is there impossible.

[From Dr. M. S. JONES, Santa Ana, Los Angeles County.]

As to my observation of irrigation on malarial and zymotic fevers, I have this to say:

I have been a practitioner for nine years in the Santa Ana Valley, and know the class of diseases above mentioned have not increased. I came here when irrigation, to any extent, was just being begun. Have seen the amount of irrigated land raised from three to twenty thousand acres, and can say truthfully no increase of the above named diseases has taken place.

The Santa Ana Valley Irrigation Company has now fourteen thousand acres being irrigated from their canal, and a large percentage of the irrigators use the ditch water for domestic purposes, passing it through filters to cisterns. Such an one I have used for three years, my family enjoying good health all the time.

I am sure there has been scarlet fever in but one family east of the Santa Ana River in the nine years, and in that family, five out of six children died, caused by want of drainage and using water where filth from a sheep corral had access.

As to tree planting on the rainfall, health, etc., I know nothing from experience, but would advise it on common sense principles.

[From Mr. A. F. KERCHEVAL.]

After a residence of fifteen years in southern California, I am of the opinion that irrigation has caused no increase of malarial diseases. Although the area of irrigated land has increased more than one hundredfold within the last ten years, there has been no increase of malarial disease, excepting in proportion as our population has increased. The reason for this is obvious. All our lands requiring irrigation are of a peculiarly porous or sandy character, underlying which are strata of gravel, bowlders, and sand of unknown depth, thus giving the most thorough underdrainage, and rendering it impossible for water to remain on the surface a sufficient length of time to become stagnant. Besides, water in the irrigated colonies is so precious that

no one could afford to let it run to waste and form lakes or pools. Usually only about one thirtieth of each irrigated district is allowed water on any given day, and during the balance of the month the ground becomes drier and drier as the moisture sinks from the surface, or is evaporated by our peculiarly absorbent and drying atmosphere.

[From Dr. W. C. SMITH, Downey.]

I have been for ten years in regular practice in the Los Nietos Valley, in Los Angeles County, perhaps the most abundantly watered region in southern California, and where irrigation is more extensively practiced than in any other region of the same extent. Cereals grow in Winter without any irrigation. During the last ten years, thousands of acres have been added to the vine and tree interests of this locality. There are thousands of acres under irrigation now more than ten years ago, yet I cannot see that the diseases of the country have been affected by it. The type has not changed nor sickness increased disproportionately to the increase of population. Intermittent and remittent fevers are almost never seen, unless imported.

It would seem that a legitimate effect of irrigation would be malaria to some extent, but there has been no such result, perhaps owing to the fact that we have a strong ocean breeze about one half of every day, and besides there is no stagnant water, nor decaying vegetation. There seem to be no local nor climatic diseases peculiar to this locality. My opinion in general is that there is no healthier location anywhere in the State.

[From Dr. O. H. CONGAR, Pasadena, Los Angeles County.]

Marsh miasm can scarcely be expected to arise from soils, free from all vegetation, that may be periodically irrigated for the purpose of promoting tree or vine development. The conditions are so widely different from those obtaining in the marshy lands that it is not reasonable to anticipate analogous effects. The use of pure water in irrigating soils devoted to vine or tree culture cannot be regarded as conducive to the development of malarial poison, but in the application of sewage, or waters bringing down decomposing vegetable matter, if used for irrigating purposes, it is not otherwise than reasonable that more or less malarial poison will be set free to the surrounding atmosphere. Waters brought down from the mountain streams in iron or cement pipes must reach their destination in as pure and wholesome a condition as when taken up, but if conveyed in open ditches, cemented or otherwise, the growth of vegetation will be found profuse, not only along its borders and high up on their embankments, but also in all shallow places in their channels. Here are favorable conditions for the development of malarial poison, and such waters, used either for domestic or irrigating purposes, are necessarily more or less unwholesome, carrying the germs of disease directly into the blood of those who use the water or inhale the atmosphere of the irrigated district. Such ditches are also but little less than open sewers, receiving filth of all descriptions, animal as well as vegetable, and statistics warrant the statement that infectious and contagious diseases not only linger in such districts, but presumably prepare the system of susceptible individuals for the reception and rapid propagation of these germs of disease and death.

Typhoid fever, scarlatina, measles, diphtheritic affections, etc., are known to first prevail along such watercourses and those using the water for domestic purposes in certain districts, and not a case appearing among the inhabitants using the same water at its fountain source, but brought out by iron pipes instead of the open ditch. The two communities breathe the same atmosphere, live upon the same soil, and in short the same environment is identical in all respects, save in the mode of bringing out and storing their domestic and irrigating waters. It is therefore apparent prima facie that the water is the source of contamination. It must be observed also that in all warm climates the growth of vegetation and decomposition is often much more rapid than in the more temperate latitudes, and if the hypothesis be accepted that none but decaying or dead organic matter is infectious, the sources of malarial poison at least will be more easily traced.

[From CHESTER ROWELL, M.D., Fresno City.]

One of the first questions asked by a newcomer into an irrigated section of country is: What is the condition of the health of this community and do malarial fevers prevail here? Speaking for the irrigated portion of the San Joaquin Valley, in which I have had a continuous residence of nearly ten years, I have generally been able to answer these questions favorably, though it cannot be said that malarial fevers do not sometimes prevail.

The complete transformation of a country that is absolutely dry, treeless, and often barren of vegetation, into almost a marsh with rank weeds growing wherever allowed, and vegetation remaining green the entire year, cannot be otherwise than productive of some sickness and of a character new to the locality. This transformation has already taken place in many parts of the San Joaquin Valley. When settlement with irrigation first began here the surface was as dry as powder for seven months of the year. The water level was from thirty to one hundred feet from the surface. Population consisted of the owners and herders of a few bands of sheep and was supplied with none of the luxuries of living. Sickness was very rare. A tract of country was surveyed into twenty-acre lots; a large canal built to the border of the settlement, it was divided into a large number of small canals and distributing ditches. The lots wed, checked, or leveled off into one to three-acre sections and these sections plowed

and scraped down to a water level. When water was turned into the canals and on to the land it soaked into the ground as into an enormous sponge, and the entire surface settled from four to fifteen inches. Whatever of vegetable or animal matter was in the soil began to decompose and gaseous poisons were liberated. Vegetation sprang up as by magic. Houses were built on each twenty-acre lot and almost from the beginning everything in the shape of vegetable or fruit was raised and consumed without limit. As the soil became saturated the water-level gradually rose higher till instead of thirty or a hundred it became from two to ten feet from the surface. Surface irrigation, which was a necessity at first, became unnecessary after a few years, and in all low lands the question of drainage became of more importance than irrigation. Wells which were originally deep filled up to the water-level, and the water in them which had been good became salty or moldy as the soil through which it had percolated had been alkaline or vegetable mold. It would seem that these conditions here, in this climate of long continued Summer, would produce an appalling amount of sickness, but such has not been the case. There has been some sickness, but it has not been malignant nor intractable, nor, as a rule, from climatic causes.

After ten years of careful observation and active medical practice, during which time the changes described have taken place over a vast tract of territory, I have arrived at these general conclusions: Irrigation, of itself, need not and does not make a sickly country. Irrigation on a large scale, where water is used to such an extent as to saturate and fill up the soil, and continued during the Summer months, will produce a general *malarial* influence. It will be most active where the soil is hard or clayey, and where the locality is protected by trees, hills, or otherwise from the Summer winds which sweep up the San Joaquin Valley nearly every afternoon. This malarial influence is but a small factor among the causes of disease. Sickness is most prevalent during the first three years of settlement, and decreases with a better knowledge and observance of the rules of living applicable here. Most of the causes of sickness in an irrigated country are visible and can be overcome, and the tendency to sickness decreases as the settlements grow older. Among causes are: Impure water, excessive and indiscreet drinking of water, careless use of fruits, and malaria. The water under most of this valley before irrigation was practiced was reasonably good, as a rule containing more of the potash and soda salts than palatable, and but little lime, but not unwholesome. As water for irrigation is brought upon the plains the wells fill up and the water partakes of the character of the soil through which it has percolated. In some localities it becomes strongly alkaline, and in others impregnated with vegetable matter, and where the roots of poplar and willow trees are abundant near the well the water becomes bitter. In any case, it is unwholesome. The continued use of the alkaline water deteriorates the blood, weakens digestion, and prepares the system for the development of disease. When strongly impregnated with vegetable matter, as is the case in the black loam and clayey lands, there is no question but its use is one of the most prolific causes of fevers. There are few localities in the valley where good water cannot be obtained by boring down to the original good water levels and casing the wells with impervious iron cases, which should be firmly *landed* in one of the stratas of clay which underlie the valley. In this way the surface water is cut off and a possible cause of sickness obviated.

The excessive drinking of water and the indiscriminate use of fruit are matters wholly within the control of people themselves, and while, next to impure water, the causes of a great deal of sickness, no remedy can be here suggested.

As has been stated, where irrigation is practiced extensively, a general malarial influence will be developed, but experience seems to demonstrate that except under very unfavorable conditions the malarial influence will not be active, and has a tendency to decrease rather than increase with time. Where the soil is loose and porous, whiteash or sandy, with a rapid underdrainage, as is the case on the plains west and south of Fresno, with moderate care it is doubtful whether malaria will ever be seriously felt. The Summer northerly winds exert a purifying influence, and localities receiving the full benefit of them are less affected than localities cut off from them by the contour of mountain ranges or by timber. The effect of tree planting can scarcely be estimated as yet, though it is certain that the growth of willows and cottonwoods already allowed on some of our farms, by shutting out the winds, has already brought a harvest of fevers. The prophylactic properties of the Australian gum tree in malarious sections remains to be demonstrated, few here having planted these trees in sufficient numbers to have any appreciable influence. In one case on a large ranch that has been irrigated for nearly ten years, the buildings are situated immediately adjoining a large eucalyptus grove, and malarial fevers have never prevailed there. As they have prevailed on adjoining ranches it would seem that the gum trees have served as protectors. The tree is clean, free from insect pests, purifying and health giving, and its cultivation ought to be encouraged. Satisfied of its beneficial influence, as well as of its value as timber, I have urged its planting in every part of the county, and believe it will yet prove one of the most valuable adjuncts to the health and the wealth of our community. It is a remarkable fact that diphtheria has never prevailed to any considerable extent upon the irrigated lands of this part of the State, though it has prevailed in a most malignant form on the dry lands of the plains and in the foothills and mountains. I can give no satisfactory explanation of the fact, and have heard none given. Likewise pneumonia is rarely ever seen in our colony settlements, and typhoid fever is rarely met with in these localities. As almost the entire State of California must eventually be irrigated, the health changes likely to occur become a matter of great interest, and I would urge that it receive the attention of physicians in every part of the State.

SANITARY DRAINAGE.

By Wm. Ham. Hall, State Engineer.

SEWERAGE—THE DEVELOPMENT OF THE COMBINED AND SEPARATE SYSTEMS OF SEWERING TOWNS. SEWAGE DISPOSAL—THE DEVELOPMENT OF THE WRONG AND THE RIGHT WAY TO DISPOSE OF SEWAGE. SEWERAGE AND SEWAGE DISPOSAL FOR CALIFORNIA CITIES.

Naturally enough leading works in the sanitary improvement of houses and towns must ever be those for the removal of the waste products of animal and vegetable life, and of man's industrial pursuits—matters subject to decay or decomposition, and, hence, liable to give off unwholesome or disagreeable influences, and to harbor or evolve low forms of life, destructive to our comfort and healthful existence.

Segregating the distinct operation of street cleaning and the labor of the scavenger generally, the generic head under which this work comes is Sanitary Drainage. More specifically, *House Drainage*, *Town Sewerage and Drainage*, and collaterally, *The Disposal of Sewage*; each subject having a class of questions, scientific and practical, peculiarly its own, but all pertaining to a common end—the preservation of the purity of our atmosphere.

Before separately considering these questions, it is well to glance historically at the whole subject of sanitary drainage, for in so doing we are at once brought to realize certain fundamental errors which have grown into the practice of sewer construction and sewage disposal; and, by tracing their development, we will the more readily appreciate the embarrassing complications to which these have given rise, the failures they have caused, and thus be the better prepared to accept those advanced ideas whereby such mistakes are to be avoided.

Although the art of sanitary drainage in some of its departments had an existence in ancient times, which, by the remains of works, to this day we recognize, and which we learn of in the literature of the Romans and other ancient peoples. The house drainage, sewerage, and disposal of sewage works of our day is an independent outgrowth from natural first principles; a complete, but not a *completed* development, *ab initio*, of a comparatively very few years in the past.

The system upon which most modern towns and cities have been sewered had its origin in the primitive land drainage work of western Europe. The sewers of the great European centers of population, for instance, are the direct descendants of the open ditches, which skirted the roadways and led off the surplus rain waters from the primitive villages out of which these cities have grown.

The house drain was altogether unknown less than two centuries ago; when the tub and the yard gutter alone were the vehicles for the

removal of "slops," and the scullion and the scavenger supplied the motive power which now our water-heads furnish.

Thus, sewage itself, as we have to deal with it, is a modern combination of various waste products, some of which formerly were separately disposed of, others of which are recent productions of man's industries or more refined habits, together with the waters which naturally or artificially are distributed through the towns, and whose presence, after use, is no longer desired.

Going back to the first periods of development: as towns grew, the mere *drainage ditch* gave place to the better formed *gutterway*. There were no water-closets, sinks, drained washstands, and bath and wash tubs. Pits in the earth received the more noxious offal; the soil of the yards absorbed the slops; and surplus drainage waters found escape into the gutters which led into the roadside ditches, ending in natural watercourses.

With the concentration of population upon limited areas, the advance in habits of luxury by portions of such populations, and the development of certain industrial pursuits, came the production of more "slops" than the soil about the habitations and shops would absorb, and the necessity of conducting these away. While, with the increased traffic of the streets, and the demands for convenience by a better class of travel, came the desire to prevent the formation of inconveniently large and offensively dirty gutters.

Out of such wants grew the *paved* gutterway, into which house slops found entrance by similar paved channels from the yards of the larger and better classes of habitations and shops, or by the use of pails and tubs from the houses of less pretention and complete appointments.

Such developments occurred in countries where rainfall came during almost every month of the year, where the gutters, consequently, were often flushed out and cleansed by the surface drainage waters. Yet these channels became more and more offensive as populations increased, as yard drainage was made more perfect and general, and as the development of manufacturing industries brought on the production of another class of noxious waste products, which found its way also into the gutters. Then came the necessity for cleaning these gutters by manual labor, to relieve them of the silt washed from the soil and roads, and the slop settlings from man's habitations, those of his domestic animals, and the localities of many of his industrial pursuits. The inconvenience of such open channels for these purposes through the streets, becoming apparent, they were constructed deeper, walled up on the side, and covered with stones or timbers.

Thus was developed the primitive sewer of modern times—a flat paved bottom trench, with vertical rock wall sides, and a flat stone covering, built through the center of the street which sloped in from the curbs to the drainage line. These sewers were at first constructed just below the surface of the ground; their covering stones, forming a part of the street paving, were removable to admit of cleansing the waterway by manual labor, and at special points openings were permanently left, wherein the surface drainage found entrance.

They were, indeed, covered gutters along the centers of the streets, into which house drains, generally smaller water passages of the same description, carrying the slops, were led, and into which necessarily the rain waters gathered from the paved and roofed surfaces of streets,

yards, and houses, also found entrance to be led to the nearest watercourse.

The modern system of water supply and distribution throughout cities and houses had not been introduced when this primitive kind of sewer was in general use. The consumption of water in private and public buildings was insignificant in amount as compared to that which has grown up since the general introduction of water pipes and taps, and the various modern conveniences and refinements of housefitting.

The primitive sewer of the kind of which we have spoken, as well as those which followed it for a long time, was a channel of form and dimensions such as required a large volume of water to have any appreciable clearing action upon the deposits; so that the presence of surface drainage waters, as they came occasionally in large volume, was as necessary as that they should be thus conducted was natural.

Thus it came to pass, by a sort of natural development, that surface drainage waters were permitted to mingle with the house slops and other offal matters, in the primitive sewer, and that sewage thus formed was conducted into watercourses, as a means of disposal.

These are the two fundamental errors which lie at the root of all the complications and embarrassments in sanitary drainage practice, and which have been the causes of unsatisfactory results—financial, sanitary, and engineering—in the collection, transportation, and ultimate disposal of sewage.

Let us go on with our glance at the development of the ordinary sewerage system, and our identification of its evil consequences. The pave-covered gutterway—the primitive sewer—becoming offensive, gave place in newer sewerage works to channels of similar construction and form built deeper in the ground, covered over with earth, and with openings at intervals of several hundred feet only, or at the street crossings. Receiving the rain waters collected from imperfectly paved streets, a great deal of silt was brought into these subpassages, and the surface drainage water flowing generally for short periods of time only, and not having a constant scouring power, this silt lodged in the waterways, and filled them up. Moreover, the volume of sewage waters was so small that when no rain-drainage waters were running, the sewage flow, being spread over a wide surface of mud and silt, lost its scouring power, and deposited its solid filth, thus contributing to choke its own waterway. The sewers filled up.

The only remedy for this seemed to be to make the sewers big enough for men to pass along and clean them, and accordingly they were so constructed, and the openings at the street crossings, used for the admission of the workmen and the passage of the cleanings of the sewers in baskets or tubs, became known as manholes, which appellation has remained as a technical name to this day.

Improvements in sewerage systems now took the form of better constructed sewers. They were now made of brick, with inverted arches for their bottoms and proper arches for their crowns, but still retaining the vertical sides, so that they were just the same top and bottom, and would have answered their purposes just as well if turned upside down.

These improvements originated not from the desire to make the nnels carry off their filth the more readily, by shaping the bot- round, but to attain greater strength in construction—a brick

passage with an arched bottom and top being stronger than one with flat bottom and top.

This move in the development of the modern sewer, although originating in motives foreign to hydraulic science, was a step in advance towards a sewer formed and laid in accordance with hydraulic rules; for the round bottomed channels proved better adapted to the transportation of silt laden waters and foul sewage than those of flat bottoms, the flow when at minimum volume, being concentrated in the narrower channel of the arch invert, was the better able to carry forward its sediments.

Thus, from accidental circumstances, perhaps, came the argument, if not the original suggestion, which led to the construction of the egg-shaped sewer; in which form the bottom is made in the shape of a small half circle or inverted arch, the top or cover in the form of a larger arch, and the sides also in curved form, joining the ends of the top and bottom arches.

In this form of waterway the least volume of flow has the least width of channel in which to move, and as the volume is increased and rises in the channel, the width increases, to give it space to pass.

Even with this improved form of conduit, tending much to render sewers self-cleansing, as these have generally been laid, until quite recently, the work of cleaning by manual labor has still been necessary; for heavy silt, gravel, pieces of brick and stone, iron, and many other substances difficult to be moved by water currents, admitted to the sewers with the rush of rain drainage waters, lodge and produce stoppages.

With the introduction of this oval conduit sewerage work began to take on the form of an art governed by scientific principles. But it was a very imperfect art and the science which should have ruled was hampered by foolish custom, local prejudice, self interest, and individual ignorance.

As I have said, it was the custom, and had been from the beginning of the development of modern sewerage work, to admit surface drainage waters into sewers—there was nowhere else to carry them, unless above ground in gutters—in fact, these drainage waters had a sort of preëmption right on the sewers, for, were not the sewers evolved from the gutterways and these in turn from the roadside ditches which were originally made for drainage waters only? The sewage was the new comer in the drainage way. There always had been surface drainage waters to dispose of, but modern systems of water supply in the houses, recent improvements in house conveniences, developments in manufacturing processes, as we have seen, had created a new species of offal, namely, that special water carried filth, which, with its carrier, we call sewage, and this class of filth, finding its way into the gutters, forced the development of the covered passage and finally of the modern sewer, for its reception, into which was admitted, very naturally, also the surface drainage waters which brought the dirt, sand, gravel, stones, and bricks which chanced loosely to lie in their way.

This was one custom which prevented the development of a perfect sewerage system on scientific principles years ago. The egg-shaped sewer, which, as we have seen, proportioned the width of waterway somewhat to the varying volumes of sewage presented for conducting; the storm-overflow sewer, which, ac[illegible] to the ordinary sewers at [illegible] of space, admit[illegible] ilt

of smaller dimensions, and thus contributes to the same end of proportioning the waterway to the volume to be carried; the intercepting sewer, which, introduced into old systems, takes up the volume of flow from the several sewers of a system at points in elevation and alignment favorable to a better outfall gradient, thus preventing the loss of elevation incident to sewers from high districts running into low districts and becoming too flat in slope before reaching an outlet; the introduction of silt-basins or reservoirs at intervals along the sewer lines, to catch the heavier sediments where they could the more easily be cleaned out; and the proportioning, in some degree, of the sizes of sewers to the duty to be performed; were the more marked steps in advance which engineers were enabled to make in the face of customs to the contrary.

But even with these advances and many others, each less important, perhaps, but all contributing to eliminate some elements of former failures, the results of sewerage works where projected upon the hypothesis that surface drainage as well as sewage waters are to be led off in the sewers, are often unsatisfactory, if not disgraceful to civilization, from a sanitary standpoint, and they are so very expensive as not to be at all within the reach of very many towns that ought to be sewered, and the temptation to slight the work of construction when such is attempted, is thus made so great as to impair the efficiency of those which are carried out to a standard below what is due from the system itself.

THE POLLUTION OF RIVERS, AND THE USE OF SEWAGE IN IRRIGATION.

Another baneful custom growing out of the primitive habit of running sewage in channels common with surface drainage waters, and afterwards the practice of taking surface drainage waters into the sewers, was that of conducting the filthy liquid into watercourses, thus polluting the waters and poisoning the channels, in the older settled countries where sewerage works have been carried out, to a degree that has called forth the most vigorous protestations, and producing injuries which have at length found redress in the Courts.

This custom grew as gradually as the idea of sewering towns itself, and its effects were so gradually made apparent to the untrained observers of the time, that the impression became fixed that river and tide-agitated waters purified themselves of the noxious organic matters which were carried into them, and it has been with considerable difficulty that the contrary truthful conclusion, now thoroughly established from scientific observation and close research, has been realized by the prejudiced public mind.

It has always been the custom to conduct sewage into the streams; it is a liquid matter; it is simply dirtied water; continue to put it into the streams, and let it be carried away, as a matter of course: so said the unthinking and the prejudiced public.

The streams purify themselves. The organic matters are oxidized by contact with the air over the water and the air in the water. Observe that the waters of such and such rivers into which sewage is led, become clear and limpid several miles below the sewage outfalls: so said the scientists of not many years ago.

But all streams did not thus apparently purify themselves. As the use of modern house conveniences, and the development of manufacturing interests necessitated the extension of sewerage works, and

contributed to the volume of sewage and the offensiveness of its character, streams in England and in some of the continental countries became so frightfully foul that reform could be put off no longer. The power of law was evoked; the aid of an advanced science was called in, and the principle of right in human affairs, and that of truth in science, were alike brought forward and recognized. It was shown that the deposit of sewage in watercourses did materially and almost irremediably pollute the waters of streams, and this was held to be an act which no individual, establishment, or community had a right to commit.

Then came the question, pressed closely upon very many communities, and for the first time fully realized by the people: "What is to be done with sewage?"

In the meanwhile there had grown up, in several places, a practice of putting sewage on lands for the irrigation of crops, and the fertilization of the soils. This practice had come about in some cases at least—Edinburgh, for instance—somewhat by accident, and from small beginnings had developed to considerable proportions.

The impoverishment of soils by long croppings made a demand for fertilizers. Advanced agriculturists recognized the value of sewage for this purpose and advocated its use in irrigation, for its manurial qualities more than as an irrigant; for, in the countries of which we speak—England and Germany more particularly—artificial irrigation is not generally necessary.

Thus in some other cases the use of sewage on lands became a fact through motives of agricultural economy, and thus experiences were accumulating which have proven of the utmost value in the solution of the troublesome sewage disposal question, which at a later day has pressed itself upon the public and the municipal authorities.

The right way to dispose of sewage is to apply it in irrigation on lands, said the advanced minds more than thirty years ago. What! keep the filthy liquid at home? Spread it out to the influence of the sun and pollute the air we breathe? said the public. No, pass it on down the rivers to the sea. If the waters do not become purified, let the sea receive and swallow up their impurities.

We are wasting the fertility of the world. At the present rate of advancement in sewerage works and consequent leading away of elements of fertility to the sea, the life of our soils is fast ebbing away, and in a few years (geologically speaking) these will be barren lands, was urged on the one hand; while, in reply, it was cried that forage and food produced by sewage irrigation must certainly be unhealthful and otherwise objectionable. So, the public did not want them.

The rate-payers objected to being taxed for sewage disposal farms, and consequently the argument that sewage was a most valuable element in farming, and that investments in sewage farms would yield handsome returns, was advanced and made the most of by those opposed to the pollution of the streams.

This led to the establishment of a number of sewage farms; the communities borrowing the money to meet the outlay in the expectation that the profits of the farms would pay back interest and principal.

Failure resulted. For what reasons in detail it is not necessary to inquire here, but one of the principal, if not the chief of reasons, was that the volume of sewage presented at these farms for use, was, of

course, most when the lands least needed watering; for when, during storms, the lands were wet, the sewers bringing the surface drainage waters from the streets, as well as the sewage, presented several times as much liquid to be disposed of as was the normal flow due to sewage alone. This, giving rise to many complications of management, discouraged the farmers, made more expense necessary, discouraged the town authorities, and affected the vegetable growth in a way that detracted from its salable value.

Sewage farming generally proved a financial failure as a municipal venture, and the prejudice against it as a means of sewage disposal and purification was intensified. Thus it was that the original practice of admitting surface drainage waters into the sewers contributed very largely to a most serious setback to this sanitary reform of the proper disposal of sewage on lands.

THE SEPARATE SYSTEM OF SEWERAGE.

In the meanwhile, however, over thirty years ago, the development of house drainage work led to the construction of systems of drains for several small places in England, into which the sewage waters, together with some rain drainage waters from housetops, were alone admitted. The great bulk of the rain waters, which, collecting from paved streets and courtyards, ordinarily finds its way into the sewers at the street corner openings, was excluded from the drains at these places and made to find its way separately into the watercourses through open channels, gutters, or other conduits. The drainage system thus devised for sewage alone was called the "separate system of sewerage."

It was received with little favor by engineers generally; in fact, it was condemned. Most engineers alleged that the water supply and use of water in the towns was not enough of itself to keep the drains flushed, and they consequently would close up with the solid matters of the sewage.

There was something in this argument against the general adoption of the separate system of sewerage at that time; and even to this day in many older communities the amount of water consumed per individual is not more than a tenth as much as in the case of our more modernly constructed American cities, and it is possibly necessary in such places to have the flushing action of rain waters to maintain an underground drainage system, or at least to have the sewers big enough to be cleaned mechanically, and if they are necessarily thus large, then the surface drainage waters may as well be admitted into them, and thus the separate system be defeated.

The separate system found few supporters amongst engineers of standing in the profession, until within the last decade, when it has been realized by many that prejudice, the outgrowth of ordinary usage and common practice, had much to do with its wholesale condemnation at first.

The view is yet maintained by many engineers whose experience has been chiefly had in the sewering of cities where streets and yards are paved and houses built close together, and consequently the volume of surface drainage waters is very great and inconvenient to have flowing in the surface gutters, that sewers must be made to carry surface drainage waters as well as sewage. They seemingly ignore the

fact that all sites demanding sewering are not thickly populated and closely built up and paved, as are the scenes of their labors.

Furthermore, at some sites, sewerage works are in operation wherein by a more thorough knowledge of the hydraulic principles involved, the sewers have been laid so as to be constantly self-cleaning, though subjected to the full flow of storm waters sometimes, and again carrying only the small stream due to house drainage alone.

The fact is known to American engineers generally, however, that very many city and town sites do not admit of sewering on this old system in a manner to render the sewers self-cleansing, at any reasonable expenditure of money.

THE COMBINED AND THE SEPARATE SYSTEMS.

Notwithstanding the advance that has been made in appreciation of the true application of systems of drains for sewage alone, the war, so to speak, between the advocates of sewering towns exclusively on this principle, and those who oppose it, still goes on.

It is urged by the advocates of the separate system that sewage alone being admitted to the sewers—drainage and rain waters being excluded—the volume is kept at a minimum amount, and, as near as possible, uniform, and that, hence, the smallest sized pipe sewers adapted to the service may always be used, thus cheapening the construction and systematizing the planning of the works; and, it is further argued that, the sewage alone being thus brought to an outfall, its use in irrigation on lands is facilitated and greatly cheapened, rendering this means of disposal not only possible at all times, but economical. This argument is sound, and in accordance with the facts of many experiences.

But, on the other hand, it is shown by the advocates of the combined system that the surface drainage, or storm waters and sub-surface drainage or ground waters, must both be carried away, and if we are to classify and separate these drainage waters of a city, we will have three systems of drains to carry them away; and, hence, the cost of complete works will be greatly enhanced. Furthermore, it is argued that the storm waters carrying the filth of roofs, paved yards, courts, alleys, streets, and gutterways, are themselves no purer and fit to be admitted into streams than is the sewage proper; and, hence, should, if sewage must be, used on lands for purification, or, being admitted into streams, the advantage, to the streams, waters, and channels, of keeping sewage out of them, is thereby nullified.

To these specious arguments it is replied:

(1.) Comparatively few town or city sites require subsoil drainage to keep the grounds in a good sanitary condition, and those which are too moist for healthful dwelling places can only and should be properly drained, as agricultural land is drained, by works designed specially for the purpose—certainly a pipe cannot be at once water-tight to keep the foul sewage in and prevent its escape and the pollution of the soil, when it is not fully charged with water, and at the same time be porous or open to admit the entrance of the subsoil water, when the ground is overcharged therewith. Subsoil drainage and sewerage cannot be combined in the same system of pipes, except as the sewers may be used for the main conducting drains, and a complete system of collecting drains be laid, independently of and in addition to the collecting sewers, without at times and places

having as much sewage running out into the soil as there is drainage waters taken into the sewers, at other times or places. As a complete set of collecting drains has to be laid anyhow, there are few sites which will not admit of independent and convenient outfalls for the drainage waters thus collected, and by independent main outfall pipes; and thus the additional expense for drainage separate from sewerage—the drains being laid in the same trenches as the sewers—may not be any greater than the increased cost of the sewerage work if proportioned to receive the drainage waters also, and certainly will not be greater if the sewage has to be pumped away, while the drainage may be run to a nearer outfall by gravity.

(2.) By no means all sites require provision of long underground conduits for surface drainage or storm waters. On the contrary, only those places where no local outfalls, at short distances, into natural drainageways, can be had, and which are closely built up and paved, require such provision to be made. There is almost always some natural channel, or channels, near at hand, into which storm waters may be led by short lines of large conduits, specially constructed for the purpose, but into which it would not do to conduct sewage, on account of its polluting the waters.

(3.) The cases wherein storm waters are so foul as to render them as damaging to the waters of streams as sewage would be, are confined to localities, first, where snow of the streets, yards, etc., collects filth for several months of Winter, and then, melting, sends down its accumulations in a short space of time; or, second, where streets, yards, etc., are not properly cleaned. These cases merely illustrate, first, the fact that some watercourses cannot be at all localities kept altogether free from the filth of cities; and, second, that thorough street and yard sweeping is an essential part of the duties of municipalities. It cannot be maintained that a municipality should provide means for carrying all its water-carried foulness into the adjacent streams, because, by neglecting to properly clean its streets, a great deal of foul matter will get there anyhow.

If street drainage waters are foul in cities, let the streets be more thoroughly cleaned. The assertion that street drainage waters will foul streams anyhow, and hence we may as well run sewage into them, is no argument at all against the reform in sewer construction. It is merely an evidence that a reform in street cleaning also is needed. Surface drainage waters are naturally due to adjacent watercourses. The town supply waters brought in pipes, it may be from some other watershed, are not naturally due to such watercourses, and are certainly not thus due, after having been used and fouled by every artificial as well as natural means of which people avail themselves in the pursuit of their occupations, as well as the satisfaction of the necessities of life.

SEWERAGE WORKS FOR NEW TOWNS.

Sewerage works in new places must be rendered as cheap as is consistent with efficiency. A town may live, and grow, and flourish, for a number of years without the necessity for surface drainage being provided, or outfall for its surface drainage waters; but there is a necessity for sewerage—a means for collecting sewage and conducting it away to some point of efficient disposal—from the moment that a house is built and inhabited.

The pollution of the sites of our towns by the use of cesspools is a practice unworthy of the most degraded peoples of the earth, and is only tolerated in civilized communities because the people do not know what they are doing. From the time that one habitation causes the apparent necessity for some such makeshift as a cesspool, there is a necessity for a sewer pipe in its stead, and a necessity for the preparation of a plat of land to receive and purify the outpouring sewage.

Typhoid fever and other zymotic diseases are of frequent occurrence in isolated places as well as in built-up cities. Continued long occupation and peculiarities of soil, subsoil, etc., which are not fully understood, contribute to the development and propagation of these diseases. Small communities—single habitations even—are subject to them. Small hamlets should be sewered, and should not poison the ground of their sites by disposing of sewage in cesspools until they are grown enough to warrant the construction of extended systems of sewers.

It is absurd, therefore, to oppose on broad grounds the adaptation of the separate system of sewerage, in new countries particularly.

There is hardly a town in California, except San Francisco, where any considerable necessity exists for underground drainage ways for storm waters, and there are twenty towns and small cities whose inhabitants are not ashamed of the filth they live amidst only because they do not realize the situation, and which filth would have been preventable by a proper system of sewerage.

Take any considerable interior city—Sacramento or Stockton, for instance—suppose that by some powerful agency all dwellings and evidences of occupation, save only the gaping cesspools, could be removed at once, leaving the level plains thickly studded as they would be with these sinkholes of foul matter. Suppose those who are the present inhabitants of the place should then come along in search of a location to build on. With what feelings would they contemplate the particular site through which they would have to thread and wind their way with careful step and slow advancement amid the cesspool pitfalls—would they choose that place for their city? Would they not move on and camp somewhere else? And yet these people are living day after day, and year after year, in those very places that they would shrink from were they uncovered; and the fact is that the covering of them, though it renders them less perceptible, makes them the more dangerous to health. A cesspool which is always kept open to sun and air, is infinitely less dangerous to health than one smothered in by a lot of buildings.

The separate system of sewerage is peculiarly adapted for use in California and in all pla es of similar climate. We have more than six months each year without rainfall. Should we construct sewers to carry away the surface drainage waters of the few rains of Winter, these sewers would be much too large for the sewage at other times. They would probably be—as in some cities in much more favorable climates—mere elongated reservoirs of stagnating filth, for months at a time, with no adequate flushing flow. There is not a city in California, not even excepting San Francisco, which should generally combine its storm drainage system with that of its sewerage. The time is approaching when the great big brick *sieves*, which are now constructed in San Francisco under the title of sewers, will be given over to the conducting of storm waters only, and a separate system of

piping, water and air tight, except at house inlets and ventilators, will be constructed for the collection and removal of sewage only.

Every city and town in the State should be compelled by law to purify itself of the noxious wastes of its own production, and should be prevented by law, under heavy penalty, from getting rid of these noxious matters by dumping them into streams. Let us draw some conclusions:

1. For sanitary reasons and from motives of decency, sewage matter and sewage should be promptly removed from our cities and towns by some system of carriage through pipe conduits, and should, for sanitary and economic reasons, when the locality will admit of the plan, be properly used on prepared lands in irrigation.

2. Surface drainage, or storm waters, should not, as a general thing, be admitted to conduits in which sewage is carried, and never when the outflow is to be used in irrigation. There should be a separate system of conduits in which to carry away the collections of storm waters from the street gutters.

3. Sub-surface drainage, where necessary in a city, and this will occur *very* seldom in California, should be effected by collecting tiles laid specially for the purpose, and where possible the outfall for these should be independent of that for the sewage.

4. In cases where, from financial embarrassment or physical cause, it is not possible to dispose of sewage by application to land:

(1.) When an outfall may be had on a tide-swept seacoast, not in the neighborhood of points of human occupation, the crude wastes may be conducted into the sea at a favorable point for outfall from the shore.

(2.) When such seacoast outfall cannot be had, the sewage matter should be concentrated by mechanical or chemical means, and the sewage should be clarified by such means; the resulting concentrations should be prepared and used as manures on lands, or filtered through prepared lands; or, where these latter cannot be done, from the absence of suitable sites for such irrigations or filtrations, the clarified waters may be deposited in tide-swept bays, inlets, or rivers, of continuous flow and considerable volume.

(3.) But sewage should never be conducted into any body of water, such as a river, slough, or channel, except in the case of monster rivers approaching the Mississippi in volume, without previous clarification and purification, by the best known means available in each case.

5. The advantages and economies of living in towns are, in a measure, offset by disadvantages and economic embarrassments; among which is the necessity for the collection and distribution of a sufficient water supply for large bodies of people, and the correlative necessity for the collection, removal, and disposition of the polluted waters and waste substances; and, that as towns must pay for water supply, so must they pay for the disposal of that supply after it has been polluted by use; and they should not be permitted to dispose of their unclean wastes to the detriment of the country, or other towns or cities, or the public lands, or of the public waters.

SEWAGE DISPOSAL IN CALIFORNIA.

Let us glance at the conditions under which this sewage disposal problem is to be met in California:

The circumstances of climate, topography, hydrography, and density and condition of population, are the factors in the problem which affect it in each locality, as compared to other localities.

Recorded experiences, with improved systems of sewage disposal, have thus far chiefly been had in Great Britain, while some lessons are available from experiences in our Eastern States. If sewage is to be used in irrigation, of course it can be thus disposed of to best advantage where irrigation is most needed.

The climate of Great Britain is one peculiarly unfitted for the practice of irrigation, and the soils generally are not favorable for cultivation by irrigation; so much so that, with the exception of the irrigation of meadows for grass at a few notable localities, there are no irrigation examples of moment in the United Kingdom, except those brought about by the necessity for the disposal of sewage. Yet sewage is effectually and economically disposed of there by this process, notwithstanding the drawbacks of unfavorable climate and soils, and the absence of a farming population used to the methods of irrigation.

In Germany, even as far north as Berlin and Dantzig, with climates less favorable to irrigation the year round even than those of England, sewage disposal by irrigation is an established fact and a successful practice, directly encouraged by the Government.

In France, with a climate more like our own, this method of sewage disposal has now been in successful operation for many years in the past.

In our own Massachusetts, New York, Illinois, and Pennsylvania are examples of successful sewage irrigation; and in California, Los Angeles has set a good example by farming out the sewage flow to a company or association of agriculturists living below the town, who agree to take and use it for a certain period of time.

Now, California generally, as compared to the Eastern States and Europe, is eminently an irrigation country. This is not alone true of those portions of the State where irrigation is an absolute necessity, and where it is being rapidly developed, but it is true of the whole agricultural area of the State, not excepting even the region of heavy rainfall in the northern coast counties, or the belt of light snowfall and heavy rains in the foothills and lower mountain regions of the Sierras. We are to remember that our atmosphere is peculiarly dry, and that our rains are delivered all in a certain half of the year, while the other half is almost absolutely without downpour.

These circumstances give us a climate making artificial irrigation a necessity for the production of very many classes of crops. And when the time comes that we have a population in our agricultural districts at all approaching in density that of England, France, or Germany, or even that of our Middle or New England States, it will be found that our valleys—the most favored with rainfall even—will have to be generally irrigated to enable them to support the people.

The same circumstances of climate which make our country one favorable to irrigation and to the disposal of sewage in this way, also make our hydrographical system a peculiar one and most unfitted for the reception and purification of sewage waters.

We have many streams which run only for a few weeks each season, except in years of very large rainfall, and all of our rivers have their periods of excessively low rate of flow, unrelieved by Summer freshets, such as sweep out and cleanse river channels and waters in other

ries. The Sacramento is the only river in the State that can be other than a small stream during half of each year. With the tion of the San Joaquin and the streams and sloughs lying diately around the principal bays, tidal movement is not suffi- in any streams of the State to materially assist in cleansing their els. Compared to the movement of tides in the harbors and of the British coast that of our coast waters is insignificant. bays of California are much land-locked and are surrounded id flats and marshes that would rapidly become polluted with oxious matters brought to them.

the whole, our climate is one peculiarly adapted to disposal of e in irrigation; our soils as a general thing are favorable to irri- and to the purification of sewage; our rivers are specially un- as a general thing, to receive and carry away or purify sewage; ur bays and estuaries are not specially well fitted to this duty. future centers of population in the interior of the State will, as eral thing, not be on or near to large streams, but will be in the of plains at considerable distances from any streams at all; and ld seem to him who will look forward a few years that this is preëminently the country for a full development of sewage irri-

ns situated as are Williams, Willows, Woodland, Davisville, , Chico, Wheatland, Lincoln, Galt, Ione, Modesto, Merced, o, Visalia, Tulare, and Bakersfield, have no economical alter- to disposal of their sewage in irrigation—they have no stream id to dump their sewage in—they will have to use it on the about them, and will find themselves in a few years blessed by ecessity, if they properly prepare for the operation.

Bluff, Tehama, Colusa, Marysville, and Oroville, may lead foul drainage into the Sacramento or Feather Rivers, but the s at no distant day when this practice will be stopped, and these will be also brought to an irrigation farm as a sewage outfall. ramento and Stockton, the two largest cities of our interior val- nd most interested in the preservation of the purity of their boring rivers, will probably set the bad example of conducting sewage into them. Motives of economy of first cost will be the consideration, and it will be difficult to guide popular senti- into the channel which will sanction the spending of one dollar o save ten in the future, particularly when five of the ten will the shape of human lives at some other point or in some other unity, or in some after generation.

or the bay shore towns, they now look forward to the tidal estu- and mud flats as receptacles of their sewage; but how much vill be disappointed in this arrangement, any one who will trace story of such experiences elsewhere, and who will examine the tion of these outfalls now, can well imagine.

sewerage systems of Berkeley, Oakland, and Alameda, for ice, should converge to one, or at most, two points of outfall by s of intercepting sewers running nearly parallel to or along the hore, and the sewage thus collected should be forced away gh a pipe laid on the bottom out to Yerba Buena (Goat) Island, e given to the waters at its outstanding point when the tide is ing out. Other centers of population around the bay can prob- each similarly good outfalls at the salient points of the bay's by forcing their sewage through mains several miles in length;

but most of them will find it to their advantage, in coming time, as, for instance, San José, Petaluma, and Napa, to put it on lands in irrigation.

San Francisco should have a large intercepting sewer around her water front, to receive sewage only (not storm water and street washings), having an outlet or outlets at some prominent points on the north side of the city, and a tidal flushing reservoir or reservoirs on the south side, thus to carry all sewage matter with a heavy rush at time of lowering tide to the most favorable points for its ultimate disposal into the strong outgoing tidal currents.

SEWERAGE SYSTEMS FOR CALIFORNIA.

And now, once more, to go back from this question of sewage disposal to that of sewer systems of works for towns. What are to be the works suited to use in this State, in general terms of course?

We have seen that sewage alone should be dealt with in the sewers of our California cities, and we have thus reduced the sewerage problem to its simplest form for our climates and town sites.

Sewage should be moved, of course, by its own gravity so long as it will thus flow sufficiently rapid to keep its conduits clear of deposits and consequent choking; and to attain this end pipe sewers must be laid on grades which will give velocities of at least one and three fourths feet per second for large pipes, and two and one fourth feet per second for small pipes when running half full. When grade slopes sufficient for these velocities cannot be secured for outfall pipes, the sewage must be collected at some central points and be forced away by the application of power in some form.

Generally speaking, our interior town sites are very flat, and barely, if at all, allow of sewage being collected by gravity at one point, much less have they sufficient elevation above any point of suitable outfall to allow of their sewage being carried thence without pumping. If force is to be used, in what form may it be most economically applied?

Sewerage work resolves itself into two parts: (1) the collection of the sewage, and (2) its transmission to the point of outfall.

On most California town sites the sewage may be collected by gravity in small pipes to one or two stations, without having to lay the conduits so far below the ground's surface as to make the cost excessive. Particularly may this be done if the work is carefully planned and skillfully executed, and if adequate provision is made for flushing from small tanks located on each main and branch pipe, as has been done at Memphis, Tennessee, Keene, New Hampshire, and other points.

The separate system of sewerage by gravity flow has been much improved upon of late years. Engineers have brought together the results of past and varied experiences—failures and successes—and having discovered the weak points of planning and construction, have arranged to meet and eliminate them.

The relation of grade slopes, volumes of sewage, sizes of conduits, velocities of flow, requisite transporting power, effect of curves, turns, and junctions, and of flushing heads of water, are now well understood by those who have had the opportunity of following the outcomes of the developments of the past few years.

In cases wherein the grade slopes are even and favorable, where the town is well built up, and the volume of sewage sufficient at all

points to make its own flushing power effective, the problem of designing a sewerage system that will work successfully, is not a difficult one to the well read engineer, although even for such sites great economies can be practiced in planning by taking advantage of the details of experience elsewhere.

For sites where grade slopes are near the minimum—where the sewers have continuously to be laid deeper in the ground, as they advance down their course, in order to get sufficient fall—the problem becomes a delicate one, and will largely repay close and skilled study in the adjustment of the plan in its general features as well as in detail.

SPECIAL SYSTEMS OF SEWERAGE.

Various combinations of good parts have been made in sewerage work and the results erected into systems of sewerage to meet the difficulties of unfavorable sites. Chief and simplest amongst these is the Waring system, which has attracted much attention from the fact of its successful and economical application in the plague-ridden and almost bankrupt city of Memphis.

This is a "gravity" system, so far as collection of sewage is concerned, and is a strictly "separate" system in the exclusion of all waters except those of sewage proper. The smallest sized pipes available for the duty are used, and are laid in the most accurate manner as regards gradients and alignments, and with the utmost care as regards jointing. With these, go certain special fittings and arrangements for ventilation and cleansing, and at the head of each main, and lateral, or branch sewer, is placed a tank holding from one hundred and fifty to five hundred gallons, as occasion may require, and so arranged that, filling by a constant small stream of water, it is almost instantaneously discharged by automatic action whenever it does get full, say once or twice every twenty-four hours, thus producing a strong flushing wave from the head of each pipe sufficiently often to insure its proper clearance.

As to outfall, the Waring system has nothing peculiar. The sewage may be conducted, according to circumstances, into a well, and be pumped away, or it may be run off by gravity to any point of outfall, and for any method or means of disposal.

The West system of sewerage contemplates the laying of pipes on the strictly "separate" plan—for sewage alone—but on such grades as to insure their proper cleansing without flushing, as in the Waring system, by means of automatic flush tanks. The sewage is received in an air-tight (concreted and cemented) well, whence it is pumped by closed pumps to any point selected for chemical and mechanical treatment, according to a special method for the reduction of its solids to a manure, and the clarification or purification of its liquid constituents.

The Waring system has been applied in Memphis, Keene, a part of Paris, France, and other places. The West system has been applied at Atlantic City. Other places, as for instance Pullman, Illinois, has been sewered on a plan closely resembling the Waring system.

PNEUMATIC SYSTEMS OF SEWERAGE.

Upon sites so flat and low as even to defeat the collection of sewage one or two points by gravity flow, there must either be some mov-

ing agent employed in its collection or else a multiplying of pumping works at local stations, which of course would greatly increase cost of operation of works. In other countries this embarrassment has been gotten over by means of what are called pneumatic systems of sewerage.

As a propelling agent atmospheric pressure is utilized to transmit power in two ways: (1) the normal pressure of the atmosphere to fill a rarified space; (2) the expansive pressure of compressed air in seeking to establish an equilibrium with the surrounding atmosphere. The first of these are called *vacuum* processes; the second *plenum* processes.

The Liernur sewerage system is a vacuum process, and the Shone sewerage system is a plenum process.

By the Liernur system the sewage is collected from a neighborhood of half a dozen to a dozen blocks to a locally central tank by exhausting the air from that tank, and then opening in succession the valves of the drain pipes which come from different subdivisions of the local neighborhood, thus permitting the air to rush in from the outside atmosphere through the pipe, and carrying with it the sewage matter.

The collection of the sewage being thus effected, it is removed by similar atmospheric pressure into air-tight tanks on wheels and then hauled away for dumpage wherever desired; or, in place of the wheeled tank, a main pipe leads from each local tank to a larger central tank into which the sewage is drawn by the creation of a partial vacuum therein, as in the case of drawing it from the neighborhood houses to the local tank; and so the sewage from all of the local tanks about a town is thus collected into a central station, there to be disposed of as may seem best fitting.

When this system has been adopted the sewage is generally treated chemically in the central tanks; the solid matter, made into manure, and the clarified liquid passed away to some stream or other outfall.

It will be seen from the foregoing that the Liernur system is essentially a *collecting* system. There must always be a tank at the outfall end of the pipe wherein to create the partial vacuum and draw the sewage matter by atmospheric pressure from the other end of the supply pipe, whether it (the pipe) comes from the house where the sewage matter is produced or from a local tank, where it has been collected, to the general central tank where treated for purification.

This system must then always be combined with some other system for the ultimate disposal of the liquid of the sewage. When collected it must be conducted away by gravity to its ultimate outfall, or must be forced artificially away to a like point of disposal.

By the Shone system of sewerage, the sewage matter is collected into local tanks, or ejectors (so called), as in the case of the Liernur system, from small neighborhoods of a few blocks, but by gravity flow in ordinary sewer pipes, and is thence forced away through larger pipes to any desired point of outfall, or to a central tank and thence to the outfall point, by the pressure of compressed air behind it.

This latter system is probably the simplest and cheapest in construction and economical of management, and is best adapted to effect the ultimate disposal of sewage; and is the least likely to fail in detail of operation.

It is needless here technically to discuss the relative merits and defects of these two systems. Suffice it to say, that both systems

require the creation of power at a central station, the one by rarefying the atmosphere in a large receiver or tank, the other by compressing air in a similar, but to effect the same work, a much smaller tank.

In the case of the Liernur system, the pressure of one atmosphere only can possibly be had; while in the Shone system, air may be compressed to the pressure of half a dozen or more atmospheres and thus utilized if wanted.

In the Liernur system, special appliances have to be introduced in connection with each house drained, and an air-tight iron pipe must lead thence to the local tank; while in the Shone system, the collection to the local tanks is effected by the ordinary sewer pipes, there being no peculiar appliances needed but the valve at the end of each, at the local tank.

In the Liernur system, the operation of collecting is effected only by the intervention of attendants whose duty it is to go around and successively turn on and off the connections between the different houses and the local tanks; while by the Shone system the collection goes on by natural flow from the houses to the local tanks, without the intervention of attendants.

In both the Liernur and the Shone systems local tanks have to be provided. In the case of the Liernur, these tanks and valves must be almost absolutely air tight, otherwise the loss of power would be great in proportion to the amount possible to be acquired from the atmospheric pressure. While in the case of the Shone system the reserve of power may be so much in excess of the amount needed that the works need not be nearly so perfect in construction and delicate in operation.

In both systems central stations are necessitated, where power is to be generated either from steam or water-power machinery; in the case of the Liernur system, by the rarefaction of the atmosphere in the large receiver or tank; and in the case of the Shone system by compressing air in the similar tank. Here, again, the Shone system has the advantage, for air-compressing machinery does not have to be as perfect and delicate in make as machinery to produce a vacuum.

In both systems special air-pipes have to be laid from the central power station to the local neighborhood tanks. In the case of the Liernur system to withdraw the air from the tanks, in order that they may in turn draw the sewage from the buildings; and in the case of the Shone system to convey compressed air to the local tanks in order that the collected sewage may be forced thence to a central tank or ultimate point of outfall. Here, again, for reasons similar to those already given, the Shone system has the advantage.

In the complete adaptation of each system, pipes have to be laid from each local neighborhood tank to the central tank or outfall. In the case of the Liernur system, this pipe must be maintained almost absolutely air-tight; while in the Shone system the pipe need not be so perfect; or, in other words, slight leaks will not defeat the operation.

In the case of the Liernur system, the operation of removing the sewage from the local tanks is done by the intervention of attendants manipulating the valves. In the case of the Shone system, this operation is automatic, and requires no attention. When the tank gets full, the inlet valves are closed, the compressed air is turned on, the sewage is driven out, and the tank made ready to receive more sewage, automatically.

In the case of the Liernur system, as already mentioned, when the sewage is removed from the local tanks, unless taken away in wagons, it is drawn to a central tank, and thence has to be removed by some other process. While in the case of the Shone system, when removed from the local tanks, the pipe system may conduct it to the point of its ultimate disposition without other application of power or principle.

In the case of both systems, the matter of grade or fall of the pipes, as is necessary in any system when the sewage flows in pipes by the force of gravity alone, is immaterial; indeed, the pipes may, without detriment, except the consumption of a little extra power, run on *up grades* as well as on down grades or slopes. But, in the Liernur system the power is necessarily limited, while in the Shone system it may be multiplied and held in reserve to any desired amount.

It is in this respect wherein the pneumatic systems of sewerage possess greater and unquestioned advantages over any gravity system, and wherein the Shone system exceeds others in its adaptability of application to low and flat sites.

In the Shone system the local or neighborhood tanks are put near enough together, and deep enough under ground (eight to twelve feet), to admit of good grades or slopes in the collecting pipes from the houses of the adjacent blocks, and these pipes need never exceed six inches in diameter, or be laid more than six or seven feet as a maximum and four or five feet as an average, below the street surface. Under these circumstances extreme economy in construction and perfect efficiency of operation are assured to the point of collecting the sewage into the local tanks.

Then, in this system, the pipes leading from the local tanks being operated under pressure, are retained at sizes less than six inches, and can follow the undulations of the grounds along their routes, being laid only deep enough (two to three feet below the surface) to protect them from injury; whereas, in a gravity system the pipes must necessarily be of larger dimensions, and set on such grades or slopes as necessitate great cost for excavation in laying them, unless the ground has sufficient fall for their required slope.

The Berlier system of sewerage is a pneumatic system working by the production of a partial vacuum, as in the case of the Liernur system, but its mechanical parts possess the advantage of being automatic, as in the case of the Shone system, which those of the Liernur system do not.

These systems of sewerage, generally, have some method for the treatment of the sewage combined with them, but these chemical or mechanical processes have nothing to do with the system of works for the collection and removal of the sewage, which really constitute the systems spoken of.

A pneumatic system of sewerage is a delicate piece of machinery to be constructed and operated in a most careful manner. There are locations in California where it may be well for the authorities to have the question studied before deciding wholly against these systems in favor of a purely gravity flow system, but the sites are few in number.

SEWERAGE WORK.

By whatever system or plan adopted, in any instance, it is indispensable that the execution of the work of construction should be as near perfect as possible with the means and materials at command.

The principal fault in sewer construction is that the conduits are not made water-tight, and the result of this is not only a poisoning of the ground around by leakage, and thus a defeat of the object of sewerage, but the escape of the transporting liquid leaves the solid constituents of the sewage to settle in the sewer and stop it up.

Taking a pipe sewer a mile long, there are two thousand six hundred and forty joints to be closed. Now, a very slight leakage at each joint will go far to abstracting all the liquid flow from the pipe, leaving the solid to settle without possibility of forward movement. Such a pipe becoming choked near its lower end soon gets under a head of pressure from the accumulating sewage above. If its joints were perfectly tight this head of pressure probably would force forward the obstruction and thus effect a clearance, but, the joints being leaky, the slight head of pressure forces them more open, and the evil result is hastened.

It would seem that this is such a plain proposition that any manager of sewerage work would see and appreciate it. But the fact is that sewer pipes have been very generally laid in California in a very shiftless and inefficient manner. Generally no proper attention has been paid to bedding the pipes so as to take the strain, from pressure of the earth, off from the bell rim and distribute it along the length of the pipe; the joints have not been well filled with strong cement mortar, but have been plastered over on the outside to look as though this were done; and the earth has been filled in on the pipes before the cement had a chance to set properly, or before the line of pipe was tested. There are several towns where it is believed a better class of work is done, but the exceptions are few.

The practice in the past has been probably worse in San Francisco than elsewhere. Great brick culverts, three to four feet in diameter, have been put in where a sixteen to eighteen-inch pipe would have been all sufficient. Pipes of greater diameter have been laid as laterals leading into mains of less size, and it is even a fact that some sewers have been put in and used without outlets at all. This narrative relates to times a very few years past; whether the practice is any better or not now the writer does not know.

There are important brick sewers of considerable length in San Francisco, which the writer hereof has casually watched in course of construction from day to day, which are little better than sieves of dry brickwork for the sewage to seep through into the surrounding soil, the construction being so badly managed that the cement was washed out of the joints in the "invert" or bottom of the waterway by the flow of sewage, as fast as it was constructed, while by a very little labor and ingenuity the flow could have been dammed back and pumped by the fresh brickwork in a wooden trough or other conveyer so as not to injure it at all, and to leave the cement joints to thoroughly set before being washed over by the water.

It is apparent that where work is done in this fashion the question of a system of sewerage is not an important one. No design can be made to work well unless the workmanship is good, in a system of sewerage any more than in a watch.

Taxpayers generally are no doubt willing to pay for good work. No one desires to deprive the contractors of their just profits. Then why is it that good work cannot be generally done here? Why is it that the best class of work cannot be done everywhere in the State?

The fact is, that street work contracting is not a profitable business in California, but in cities where the very best work is insisted upon and secured, it is a profitable and good business. It would seem that the interests of contractors, as well as taxpayers, should unite them in securing some legislation, general or municipal, under which good work could be assured and satisfactory results attained.

SEWERAGE AND SEWAGE DISPOSAL WORKS FOR CALIFORNIA CITIES AND TOWNS.

It seems inevitable that for a large majority of our Californian towns and cities there must be collecting stations for sewage, where power works are located, to force it away to the point of desired outfall. This being the case, a judicious planning will result in much economy in construction and operation.

These towns will probably have to pump their water supply also, and the same pumping station can be made to serve both purposes. The sewage tank or receiver, sunk deep into the ground, and concreted and cemented, to be water and air tight, receiving its flow of sewage from the town mains, and emptied by its special air-tight pumps, need not be an objectionable accompaniment of the water tank tower and its pumps and wells, so that the same set of boilers and the same attendants may serve for the double duty of water supply and sewage disposal works. This is no new arrangement, where plans are carefully made and economy studied.

The Waring system of sewerage seems to be the most simple and economical of construction and operation.

The West system of sewerage, recently introduced, seems to possess some advantages in the respect of its air-tight sewage receiver, for the combination of sewage pumping and water-pumping works at one establishment; but this general plan is in operation elsewhere, without the intervention of the West system.

We have now briefly noticed the leading systems of sewerage works being introduced elsewhere. It may be well to mention that the State has during the past year, at the Stockton Asylum, and under the authority of its Board of Directors, carried out a work, the results of which may be watched with interest.

The sewerage system is provided for sewage alone from an institution having about one thousand four hundred occupants. The buildings are much scattered; the grounds are very flat and level; so that the pipes have been laid on minimum grades, and of the smallest allowable dimensions. These pipes, five and six inches in diameter and in all about a mile and a half in length, come together into a concrete reservoir about thirty-four feet in diameter and twenty-five feet in depth. From this station the sewage is forced through about one thousand five hundred feet of six-inch pipe to a plat of land prepared for its reception and purification in irrigation.

This plat, about eighteen acres in area, has been underdrained, by means of tile-pipe drains laid from twenty to forty feet apart and to a depth of from three to six feet. Through its length four concrete carriers, about ten inches square in cross section, have been built in ridges raised about a foot above the natural level of the ground's surface. These ridges and carriers are each two about one hundred and sixty feet apart, and the ground's surface has been shaped so as to

slope slightly from each ridge to a slight depression midway between the two ridges.

The land is to be heavily seeded in Italian rye grass, the crop most suited to cultivation with sewage as an irrigant. The operation then will be to flood the land thus cropped, by the current of sewage forced in a large stream through the pipe from the reservoir to the carriers at their heads, and thence distributed by means of the carriers and gates situated in each wall at every forty feet of their length.

The pump is powerful enough to handle all the sewage of the day in two or three hours, and the stream thrown and delivered is sufficient to make a good irrigating head on the land as prepared.

Although the soil is not well suited to irrigation at this point, being rather too heavy to receive waterings freely, it is confidently expected that the experience of a year or two at this point will do much to clear up the problem of sewage disposal in California.

CHOLERA, AND THE LESSON OF THE HOUR.

By Dr. W. R. Clunkss, Member of the State Board of Health.

In view of the prevalence of cholera in France, Italy, and Spain, and the probabilities of its reaching America in the near future, the various Boards of Health throughout the nation have been issuing bulletins advising the people of the danger which threatens them; and although the residents of the Pacific Coast, by reason of their remoteness from the point of its probable entrance, may enjoy a greater immunity from the disease than those living upon our Atlantic seaboard, yet when we consider its infectiousness and portability, and the constant and rapid inter-communication existing between Europe and all portions of our territory, we should not be betrayed into fancied security. Time and again it has been known to be transferred in the personal effects of immigrants to remote interior districts without first appearing at any port of entry, and it is by no means improbable that the first cases may spring up amongst ourselves instead of at some more exposed point. In 1876 no less than three distinct foci of cholera were thus developed in remotely located centers of America, all of which were directly traceable to the almost simultaneous exposure to the atmosphere of bedding and other luggage of immigrants from infected districts of Europe; and in the same manner it may even this Autumn be imported into California by an immigrant or returning tourist. This method of its importation has also given rise to the idea that it sometimes travels in a sort of pandemic wave through meteorological influences over a continent, or from one continent to another, and attacks the residents of a district without personal contact. Although, however, there is yet much in connection with cholera that is still *sub judice*, there is, nevertheless, nothing more clearly demonstrated than that it requires for its propagation the existence of a specific organic germ together with a soil of alkaline reaction. Whenever these are found, and when in addition an atmospheric condition favorable to the spread of the disease exists, coupled with insanitary conditions generally, but especially impure drinking water and a foul condition of privies and cesspools, cholera is sure to prevail in its most malignant and fatal form wherever the germ obtains lodgment.

While, therefore, all of the requisites for its propagation and spread may be truthfully said to exist at present in many places in California, excepting the germ itself, and when it is known that the germ is liable to be imported into our State at any moment, it is deemed opportune to sound this note of warning, and to offer a few suggestions for the guidance of our people. It is not intended, however, to present an elaborate essay upon its etiology or treatment, but rather to offer a few practical observations which it is considered to be the duty, because within the power, of every citizen to adopt. The remarkable progress made during the past decade in sanitary science

and preventive medicine, materially aid us in this respect, for we can now say of epidemic diseases of all kinds, if we put our knowledge into [illegible] practice, thus far shalt thou go and no farther. But the [illegible] of man and his thirst for gold, together with the exaggerated respect he pays thereto, are so great as to almost wholly divert his attention from the laws of health, and to induce him to trust to the pound of cure rather than the ounce of prevention.

When we learn, as surely we will ere long, that health is wealth, that for every death which occurs prematurely we are impoverished just so many dollars, and that political economists can estimate to a dollar the moneyed value to a community of this unnecessary loss, we will have reached that stage of progress in civilization which will pay a just respect to the inestimable value of preventive medicine, instead of blindly trusting to the efficacy of drugs for the cure of disease. A man dies of cholera, yellow fever, diphtheria, typhoid fever, or any other preventable disease, and is buried, and the idea never enters the minds of his afflicted relatives that to his own or their neglect of the plainest sanitary precautions is attributable his untimely death; but if a thousand dollars are lost by reason of defective collateral security, precautions against future loss from a similar cause are at once taken, and a repetition of the loss is rendered highly improbable, and there is no [illegible] in connection with the moneyed transaction, an individual or family usually having to bear the burden, whereas the health and lives of a whole community, State, or Nation are jeopardized by the existence in their midst of a single case of contagious or communicable disease, and thousands of lives and millions of dollars are likely to be sacrificed in consequence thereof.

Let us consider for a moment the moneyed loss to Memphis arising from the epidemic of cholera which prevailed there in 1873, including its loss of life, the destruction of its business, the stagnation of [illegible] its trade, including its shipping and railroad travel, the loss sustained by laborers and those employed in the various trades and manufactures, the loss to its hotels and boarding houses, restaurants and lodging houses, and the money paid to physicians, druggists, and nurses, together with the thousands of other necessities incident to the existence of a [illegible] epidemic, and we have the enormous sum of over [illegible] millions of dollars as the money penalty of that city resulting from their neglect of sanitary laws. But if this sum of money be the cost in dollars of their utter disregard of the laws of health, who can estimate the loss which that city sustained by the [illegible] of yellow fever which prevailed there in 1878. And yet, [illegible] than [illegible] to remove [illegible] their midst, for, like [illegible] in the [illegible] and still the people [illegible] a repetition of [illegible] security, [illegible] of wealth, and [illegible] we are informed, [illegible] and [illegible] varying [illegible] overflow- [illegible] engulfed

since their construction, from twenty to forty years previously; its sewers inadequate and defective; its people suffering from the depressing influences of high living, and a debilitating atmosphere thus impregnated with the products of decomposition; all these, together with an exhausted treasury, found Memphis on the advent of yellow fever, in 1878, ready for the sacrifice which history records as having been the most direful that has occurred in modern times in any civilized country. It was surely rife with the elements of a great plague, and only needed the specific germ to diffuse it widely and fatally among a people who had forgotten that such a thing existed as the laws of health and disease.

And Toulon, in France, where cholera first made its appearance this year in Europe, was in a like filthy condition upon its advent. And tens of thousands of lives in all nations of the earth are likely to be sacrificed because of the supineness and persistent neglect of sanitation of the authorities of one city.

And although equally unfavorable conditions for the propagation and spread of cholera and yellow fever nowhere exist in California, yet it is known that should the germ of either disease reach us at present, as a people we are in a condition to pay heavy tribute, for there are many foul, disease-breeding places among us.

While, therefore, there are few things more certain than that cholera will reach us ere another season passes by—indeed, our National authorities deem it highly probable that it will reach America before the close of the present year—it becomes our duty to put our house in order *now*. Quarantine we know to be valuable, and much may be done thereby to ward off epidemic diseases of all kinds; but one so subtle as cholera, and whose germs, as already stated, may be lying hidden for months, requiring only to be exposed to become rapidly propagated, can hardly be kept at bay by this means for any considerable length of time. In preventive medicine alone lies our safety. The practical deductions, therefore, to be made are, that we should remove from amongst us those causes which are known to favor the propagation of the disease when once the seed is planted therein, so that should it reach us it can be either stamped out at its inception or rendered comparatively harmless. And this can be done by adopting *cleanliness* as our motto; cleanliness not only of person, but of property, food, drink, and all our surroundings.

Where insanitary conditions of any kind exist they should be corrected. Where drinking water, the most potent source of the disease, is known to be impure, it should be at once purified, and where this is impracticable by ordinary means it should be boiled before being drank. All privies and cesspools should be emptied of their foul contents, and thoroughly washed with a solution of sulphate of iron, two pounds to the gallon of water, to which may be added with advantage an ounce of sulphuric acid, or with bichloride of mercury in the proportion of a drachm to the gallon. All damp cellars should be thoroughly cleansed and dried, where practicable, by exposure to a current of air. All stagnant pools of water should be drained and filled with earth. Indulgence in excess of all kinds, especially in the use of unwholesome food and alcoholic drinks, should be entirely avoided. In short, everything should be done *now* in consonance with the laws of health and hygiene, which science and observation teach us to be promotive of health, otherwise we will surely pay the penalty. Many of the conditions referred to are

especially known to exist in our inland towns and cities, where the people depend upon wells for their supply of drinking water, and upon the privy and cesspool system for their excrement and filth. The prevalent notion that because water is clear and apparently free from impurities, it must, therefore, be potable and wholesome, should never be accepted without careful examination and analysis, for frequently that water which is the clearest is found by chemical analysis to be the most unwholesome and deleterous. Nor should it be imagined that because privy and cesspool filth are out of sight that they are consequently out of reach of causing disease. Nothing can be more fallacious, for they are not only constantly undergoing putrefaction, fermentation, and generating poisonous gases, which reach our systems through the atmosphere, but the products are also absorbed into the soil, and frequently find their way into our drinking water.

But we will be told that it costs too much to remove the accumulations of filth from our premises, and that it will be cheaper and better to hide it from view with earth or sand. The idea is fallacious, for we are thus storing up for ourselves disease-breeding influences which will surely bring upon us a day of retribution. Their complete removal and utilization for fertilizing purposes is the only known method by which they can be rendered, not only absolutely harmless,but positively useful; for although rivers and watercourses generally are made to subserve the purpose of conveying them away harmlessly for a time, yet in the end they become noxious in places, and as population increases largely they have to be abandoned. As a prophylactic, therefore, and as a means for rendering the poison of cholera as harmless as possible, thorough cleanliness in its fullest significance should be *now* adopted by the people. No half-way measure should suffice, and no fancied security because of a "glorious climate" should lull the people into a condition of apathy and neglect of their imperative duty at this hour.

But to secure the advantages arising from thorough cleanliness, the efficacy of concerted action is necessary; for what avail is it for one to cleanse and purify while another allows his premises to reek with filth; or what does it avail us to lock our front doors against burglars if our side doors and windows be left open? The old and trite adage, that the door of the stable should be locked before the horse is stolen, is especially applicable in the case of all infectious diseases, but more particularly with reference to cholera, the most infectious of them all. It is upon its westward march, and the most extraordinary precautions should be taken now by the whole people, and before it reaches any part of America; for it is liable to pounce upon us like a tiger upon his prey, or like a thief in the night, and woe betide us if found unprepared for its onset. The whole public mind will then be eager for information; terror will fasten upon those who are attacked as well as upon those in their vicinity, and all will be thrown into the greatest confusion. But it will then be too late to adopt efficient means to prevent its spread, for it is universally conceded to be utterly impossible to institute proper sanitary regulations in cholera districts after the disease has once become epidemic.

A few years ago we had a slight foretaste of the baneful influences of trade and traffic resulting from our neglect in allowing small-pox, the most easily controlled disease epidemic in its nature known

to us—to spread in our midst, and to obtain a foothold in different parts of our State. And Philadelphia also, according to an estimate which I have recently read, paid the enormous sum of twenty-eight million dollars in 1871 and 1872 for a like neglect and from the same cause. Should, however, the cholera reach us, and find us in our present insanitary condition, no amount of sanitation after its advent can prevent it from claiming victims by the thousand, and no political economist can ever estimate the moneyed loss which will result to our State. To the people it matters not at present whether Professor Koch has discovered the germ which causes cholera, nor does it even concern them whether or not the whole germ theory is true or false. But it is of the most vital importance to them to know how to prevent it from reaching their homes; and we have endeavored briefly to point out the only known method. How to treat it should it unfortunately come to us is an entirely different and more difficult problem to solve, whereas it can be confidently and truthfully asserted, that should timely preventive measures, such as have been briefly indicated, be adopted, it can nowhere in California become seriously epidemic. Prompt action on the part of the people themselves will render it so benign that it will pass over us harmlessly, excepting in the few districts that will always exist in which reasonable sanitary precautions are never taken.

Although it was at first intended to say nothing regarding the treatment of cholera, yet we have been so favorably impressed with some observations upon the subject by Dr. J. M. Woodward, Supervising Surgeon of the United States Hospital Marine Service, in his report upon cholera to the Government in 1873, that we deem it not out of place to here briefly repeat them, especially as the more recent investigations upon the subject tend to confirm their importance and value. Dr. Curtin, in charge of the department of the Philadelphia Hospital for the Insane, in 1866, having satisfactorily demonstrated the inutility of the ordinary remedies for cholera, recollected having read of the beneficial effect of sulphuric acid, determined to give it a trial. He accordingly instructed the nurses in the hospital to inform the patients that upon the following day they would all be treated to lemonade. To his great surprise and gratification, in about twelve hours after the commencement of the treatment there was not a new case of cholera in the hospital. The supply of white sugar having temporarily given out at the expiration of the sixth day, the treatment was suspended for two days, when the disease reappeared with about the same virulence as before. Upon the resumption and continuance of the treatment, however, it wholly disappeared from the hospital. Moreover, it is stated that one old lady of celtic origin detected the deception, and informed the doctor that *he could not desave her wid his liminade, that it was nothing but ile of vitriol.* And she paid the penalty of her acuteness with her life, for she died of cholera on the following day. He also informs us that the same treatment was adopted in the surgical wards of the hospital, and that not a single case of cholera appeared in them. His method of preparing the lemonade was by adding twenty drops of aromatic sulphuric acid to about four ounces of water sweetened to suit the taste, and to complete the deception a piece of lemon peel was dropped into the liquid. This quantity they usually drank two or three times daily with avidity.

Inasmuch, therefore, as the researches of the scientists of the day, who have been devoting their time and sacrificing their lives

investigation of the subject, have found that an alkaline soil favors the propagation of the germs of cholera, whereas they are readily destroyed by mineral acids, it is highly probable that this method of treatment forms the best means for its cure. It may also be stated that other acids had been previously tried without producing any apparent good effect. But, next to cleanliness, the most important factor in the treatment of cholera is prompt attention to the diarrhœa which almost invariably precedes an attack. When this first makes its appearance, an intelligent physician should be summoned. Nor should the physician be hypercritical in his efforts to differentiate in cholera times between simple diarrhœa, cholera morbus, and genuine Asiatic cholera, for during such epidemics there are always numberless cases of cholera of so mild a character as to be readily mistaken for diarrhæa, and their true nature only determined by the development therefrom of genuine cholera. All doubtful cases should therefore be treated as genuine ones and isolated and treated accordingly.

THE DWELLING AND ITS SURROUNDINGS.

By F. W. Hatch, M.D.

Among the many subjects which invite the attention of the sanitarian few possess a deeper interest or are of greater practical importance than that which relates to the home and its surroundings. State Boards of Health have recognized this truth, and many of them have given expression to their views through the medium of their annual reports, and a number of special publications have appeared of late years, for sale at the principal book stores, designed to enforce the importance of the subject, and pointing out the most prominent defects commonly observed.

To instruct the public in the means preservative of health, to expose the errors by which the latter is constantly endangered, are, in fact, among the most useful purposes which our State Board of Health, as at present organized, are intended to fulfill; and it is by publications upon these interesting topics that they are brought into intimate contact with the people, impress their minds with salutary truths, and gradually bring about the reforms most needed. But these publications must, of necessity, have only a limited circulation; they are mainly designed to reach only the limits of a State, and even thus distributed too often fail, unfortunately, to fall into the hands of those most in need of instruction—the great mass of the people—those about to build a home for their families, or, being provided therewith, are suffering the consequences of defective construction and arrangement. Hence the attempt in this biennial report to present to the public of California some plain practical views upon this important subject, indicating the general principles which, for sanitary purposes, should be observed, and the dangers to be avoided. In order that the greatest good may result, and that the facts presented may reach those for whose benefit they are intended, they will be issued in circular form for general distribution.

It is often among the commonest affairs of life that the greatest deviations from strict sanitary precepts are to be observed. To select a site, and plan a house, are apt to be regarded as simple matters to be regulated by individual fancy, and the extent of the bank account. Every one imagines he knows what he wants, and how to build it; or, if not, the architect is called in, and further concern is dismissed. Hence, considerations of health are sometimes sacrificed for architectural beauty, and sanitary appliances slighted in the competitive estimates of *cost*.

The first step taken in the preparation of a house—that of selecting a building site—is often of more importance than any subsequent one, and mistakes made cannot always be remedied. The considerations which should guide us in the selection of a site, are several in number.

It should be dry, or capable of being made so by drainage. In general terms, it may be said that all soils contain water, the amount

depending upon the ability to absorb and retain it, and the supply. Their capacity for absorption varies greatly. Loose sand may take up two gallons of water in each cubic foot; clay, about 30 per cent; brick, or loam, from 40 to 60 per cent; good bricks, about 10 per cent; and even granite, about one pint in a cubic yard.

At a certain distance below the surface, the pores or interspaces between the particles of soil are completely filled with water, constituting what is called the *ground-water*. Between this level of complete saturation, and the surface of the soil, these interspaces are filled with air, or moisture and air, the extent of moisture depending upon the depth of the ground-water or the water-table, the porosity of the soil, its capillary attraction, evaporation, season, etc. The nearer to the surface the water-table is to be found, other things being equal, the more damp the soil. This ground-water constitutes, in fact, a subterranean sheet, or underground lake, at varying distance beneath the surface, from a foot or two to many—even hundreds of feet—not always preserving the same level, but forever in motion, rising and falling, and moving onward in a slow but ceaseless current towards the ocean.

It is supplied by rains, by pressure from rivers, and these determine its depth below the surface and its onward movement, together with the compactness of the soil, the presence of an impermeable stratum, and varying facilities for outflow. The proximity of the underground water to the surface is admitted to bear an intimate relation to the healthfulness of a soil, or, in other words, to certain diseases incident to a locality. When the ground-water is less than five feet below the surface, the soil is considered unhealthy; when fifteen feet or more, healthy. Its sudden fluctuations are also regarded as the cause of disease.

A humid soil, by the evaporation of its moisture, lowers the temperature, and is a recognized cause of rheumatism, catarrhal affections, and is one of the factors in malarial diseases. The researches of Dr. Bowditch, of Boston, and Dr. Buchanan, of England, seem, also, conclusively to establish its agency in the development of tubercular consumption. In fifteen towns in England, Dr. Buchanan has shown that by improving their drainage and lowering the ground-water, the deaths from this disease were reduced an average of 29.6 per cent. In several, the reduction exceeded 45 per cent. Humidity of the soil favors the decomposition of the organic matter it contains—the filth, sewage, and the like, which finds its way therein, poisoning the ground-air as well as ground-water—and thus becomes an important factor in the production of certain other diseases, possibly fevers of a low or typhoid form. Dr. Buchanan found in the towns above mentioned a very marked diminution of typhoid fever following the adoption of drainage.

Bearing the above facts in mind, the importance of the subject will be apparent, and it will not be difficult to understand the truth of the proposition that the *soil upon which the dwelling is to be built should be dry.*

The obvious remedy for soil-dampness is *drainage*, thus lowering the ground-water, lessening evaporation, facilitating the entrance of pure air, promoting the oxidation of organic matter, and, to that extent, diminishing the exhalation of the effluvia arising from the process of decomposition.

The northern portions of California, especially in the central valley

in proximity to the rivers, deep drainage is not always applicable. The soil is of such a character, loam, capable of absorbing and retaining, as has been stated, from forty to sixty per cent of moisture—that, for a great portion of the year at least, when the rains prevail, the outflow is rendered difficult or even impossible. This is true of portions of the City of Sacramento, and other cities, as well as of many localities in the neighboring country.

The difficulty may be measurably remedied by having a damp-proof course of zinc, cement, slate, or asphalt, in the foundation walls of the house. Stoneware (vitrified) tiles, perforated so as to maintain free ventilation, are much used for this purpose; or, if inserted at suitable intervals, will preserve the timbers from decay. Building the house, if of brick, with double walls above the damp-proof course, binding bricks or iron ties being inserted at proper intervals to secure strength, has been recommended. An air space of two or three inches is thus left between the two walls; it serves to shut out the dampness arising from drifting rains, and keep the house "cool in Summer and warm in Winter."

In what has been said, the soil is spoken of as containing *air* as well as water, and, as in the case of the latter, the more porous the soil the more air it will contain. In a perfectly dry soil, the pores are entirely filled with air; when the soil is damp, they are filled with air and water, and it is not until the upper level of the ground-water is reached—the pores then being entirely occupied by water—that the lower limit of the ground-air begins. Thus we have a subterranean body of air superimposed upon a subterranean water-sheet, each having a close and somewhat supplemental relation to the other. Like the ground-water, the ground-air is continually in motion, rising and falling, from diurnal changes in temperature, from the force of winds, from barometric pressure, and through diffusion. As compared with the general atmosphere, it is richer in carbonic acid, derived from the oxidation of organic constituents, animal and vegetable. It is alike with the ground-water, or even more readily, contaminated by emanations from sewers and cesspools, and by the decomposition of organic substances, and of solid and liquid impurities entering from the surface.

Made soils, lots filled in by dust and rubbish, are especially dangerous. They should be avoided for building purposes, or used only after cultivation for two or three years. To such an extent does the ground-air of some cities become polluted by this cause, as well as by gaseous and liquid emanations from uncemented privy vaults and cesspools and other accumulations of filth undergoing decomposition, that the soil is said to be *filth-sodden*—its air altogether polluted and deprived of its oxidizing power.

Just as the heated air of a chimney sucks in and carries upwards the colder air surrounding the fireplace, so does the heated air of the house cause the ground-air to enter in through the foundations, the cellars, and lower floors, into the living rooms above. Whenever there is a difference between the temperature of the air in the ground and that above, there must be set up motion and interchange. That this interchange is going on every day between the underground air and our homes is shown by many facts. Cases have been related in which gas has, in this manner, entered houses through the cellar although no gas had been introduced therein. "I know of cases," says Pettenkofer, "where persons were poisoned and killed by gas whic

had to travel twenty feet under the street and then through the foundations, cellar vaults, and flooring of the ground-floor rooms. * * * In such cases the penetration of gas into the houses is facilitated by the current in the ground air caused by the house. * * * Thus our heated houses ventilate themselves not only through the walls but also through the ground on which the house stands." De Chaumont also mentions a case, coming under his own observation, of fatal poisoning by coal gas, originating in the same way, and again another related by Doctor Fyffe, in which the foul air from a cesspool was sucked into a house a distance of twenty-seven feet.

Soils whose air has been polluted by the causes mentioned may be improved by removing the causes, as by the abolition of cesspools, by through drainage, by cultivation, ventilation, and vegetation. Turning up the soil in cultivation exposes it to more perfect aeration, and effects the oxidation of decomposing organic constituents, and the roots of plants and trees absorb carbonic acid and feed upon the products of decomposition. The roots of trees take up, also, large quantities of water from the soil, and thus serve a double purpose. A living oak, according to Pettenkofer, will absorb and evaporate, in Summer, eight and one third times the rainfall upon a surface area equal to that shaded by the tree, while the eucalyptus globulus, or Australian blue-gum, is stated to absorb twelve times the rainfall upon an equal area. By this free evaporation the water in soil is reduced, and the temperature lowered.

Bearing in mind the facts already stated showing the tendency of ground-air to enter the dwelling through the cellar, carrying with it foul and possibly dangerous emanations, the propriety of rendering the floor impervious by a coating of the best cement, or of concrete, will readily be admitted. This is, in fact, one of the most effectual remedies, and it has been advised, to afford yet more certain protection, to spread over this a layer of asphalt. The flooring, also, may be raised a few feet above the ground, and the intervening space well ventilated by arched or by grated openings, or perforated bricks in the walls. By the adoption of such means the ascent of foul air from below will be securely prevented, dampness will be excluded, and the comfort and healthiness of the upper apartments promoted.

There are few localities sufficiently dry, however, to make a cellar, the floor of which is below the level of the ground, perfectly safe. Such cellars serve as receptacles for the ground-water and for water percolating from the surface, and moisture, even if excluded directly by the precautions just now mentioned, will rise through the foundation walls. They are never healthy for sleeping rooms. They are commonly damp, have a limited supply of light, and are poorly ventilated.

A number of diseases have been attributed, either directly or indirectly, to emanations from the soil. Among those probably sustaining this relation are malarial fevers, typhoid and typho-malarial fevers, diarrhœa, dysentery, and diphtheria. Dr. Parkes adds yellow fever and cholera.

In some of these cases the relation is, doubtless, only secondary or indirect, predisposing thereto, as do other insanitary conditions, by lowering the vitality of an individual and impairing his resistance to disease. He thus becomes an easy prey to influences to which he might otherwise be exposed with impunity.

There have thus been passed in review some of the more important

considerations relating to the water and air in soil, especially in their application to the *dwelling*, and the evils resulting therefrom. They have been dwelt upon at some length, because they are believed to be of the very highest significance. A mistake in the selection of a location for the house, in which to live and families are to be reared, is often irremediable, fatal to the health and comfort of the inmates. A small expenditure properly laid out at the start, in draining and other needful preparations, will frequently save much more in subsequent and possibly ineffectual efforts at rectification and improvement.

LIGHT.

Sunlight is necessary to the development of all organized beings, and its deficiency is commonly associated with other insanitary conditions, as want of ventilation and impure air. Light stimulates the organic functions, improves the quality of the blood, invigorates the nervous system, promotes ventilation, and is at least indirectly concerned in the generation of ozone, the most powerful of all known disinfectants, destructive to unhealthy vapors and infectious germs. To the long continued deprivation of light has been attributed the development of several serious constitutional diseases. Animals confined in dark and unventilated cages acquire scrofula and tuberculosis; children, shut out from the sunlight in tenement houses, and even in badly constructed nurseries in more pretentious dwellings, become pale, sallow, weak, and sickly.

Hence the *aspect of the house* should be such as to secure the free access of sunlight on one side or the other both morning and evening. In the valleys of California a southern frontage secures this desideratum, and, as the winds usually blow either from a northerly or southerly direction, it affords, at the same time, the best facilities for a free circulation of air through the halls of the house. It has been objected that a southerly aspect exposes to too much heat and light in some portions of the State; but this objection, even if it were true, can only hold for a limited portion of the day, and for a few months in the year. At midday excessive light can be readily subdued by blinds or curtains, while vegetation—trees—will afford a grateful shade, and at the same time beautify the premises.

This brings us to the consideration of the action of *vegetation*. The general effect of vegetation is to cool the ground by obstruction of the sun's rays, and diminish evaporation from the surface; yet, as before stated, large quantities of water are taken up by the roots of trees, and evaporated by the leaves, thus lowering temperature and increasing the humidity of the atmosphere. In the oak tree, of which mention has previously been made, it was found by Pettenkofer that, while the rainfall was only 25.6 inches, the evaporation from the leaves amounted to 2.12 inches.

Vegetation also improves the quality of the air by absorbing carbonic acid and giving off oxygen. This is effected by the action of the plant-cells containing the coloring matter under the influence of the sunlight. Yet, while a certain amount of vegetation is grateful and beneficial, its excess may do harm by obstructing the movement of air and impeding ventilation and rendering the atmosphere moist. Without vegetation, in a warm climate like that to which the valleys of California are subject during a portion of the year, a treeless home, with no herbage to relieve the eye, is desolate and uninviting indeed.

Quite often, on the other hand, the opposite extreme is reached, and in the eagerness for ornamentation the sunlight is excluded, the air is motionless and stagnant, damp, and impure, and this dampness extends to the walls and the interior of the house. Extremes are to be avoided.

When about to build a house, having taken due care for the locality that it is dry, and for the purity of the air in the soil, and having observed the rules suggested for keeping the structure free from excess of moisture, and from the entrance of impure and unwholesome emanations, and having seen that the aspect and its surroundings are such as to insure an abundance of sunlight, provision should be made for its proper construction—its ventilation, warming, and drainage.

VENTILATION.

The atmosphere consists normally of a mixture of nitrogen and oxygen, in the proportion of four volumes of nitrogen to one of oxygen, or about seventy-nine parts of the former and twenty-one parts of the latter. In addition to these, under the most favorable circumstances, there are, carbonic acid, 0.4 volumes; ozone, a variable quantity; vapor, varying with the temperature; organic matter and ammonia, *traces*, and more or less suspended matter.

Practically, in the air of occupied dwellings, the normal proportion of these constituents is never maintained. As will be seen immediately many circumstances concur in making the preservation of a uniform standard between the outer and inner air impossible. The aim should be to approximate it as closely as we can, and this is, in fact, the purpose of ventilation.

The air of the dwelling is vitiated by those who occupy it—by *respiration* and *transpiration*—that is, by the lungs and skin. It has just been stated that the normal amount of carbonic acid may be estimated at 0.4 (four tenths) of a volume per 1,000 volumes. This is seldom realized in even the best houses, and Dr. Parkes and others have agreed that the maximum limit should not much exceed 0.6 per 1,000; that is, 0.4, the carbonic acid naturally existing in the air, and 0.2, which is considered the average limit which should exist as respiratory impurity. Any great excess over this amount is said to be distinctly perceptible, an effect due not so much to the carbonic acid itself as to other impurities with which it is associated—especially the organic matter—and of which it is the measure. When the carbonic acid reaches 0.9 or 1. per 1,000, the air is described as close and *stuffy*—words well expressing the sensations which almost every one has experienced after passing from the fresh outer air to that of a poorly ventilated room crowded with human beings. Hence, it has been proposed to consider an apartment properly ventilated when the air it contains presents to the sense of smell no marked difference from the outer air (De Chaumont). An adult man gives off by respiration in an hour about 0.6 (six tenths) of a cubic foot of carbonic acid, and the important rule to be observed is, that sufficient fresh air should be supplied to prevent any excess above this standard. For this purpose the air of a room has to be renewed, and this renewal will be more or less frequent according to the size of the room. A change of air in a room more frequently than three or four times in an hour is considered all that can be comfortably borne without a

draft. But the highest authorities agree that not less than 3,000 cubic feet of air are required on an average for each individual every hour, and the cubic air-space in the room must be sufficiently great to allow this amount of air to pass through hourly without producing perceptible draughts. This would require an air-space of from 750 to 1,000 cubic feet, according to the frequency with which the air of the room is changed—whether *three* or *four* times an hour.

It is important to bear in mind that the essential requisite in good ventilation is that a *sufficient amount of air may be supplied without a perceptible draught.* For this purpose the movement of the current should not exceed eighteen inches per second. The limit of the movement of air consistent with comfort depends somewhat on climate, and season, and individual idiosyncrasy, but it is safe to say, generally, that when a draught is felt this movement is greater than 18 or 19 inches per second, or about one mile and one third per hour. The larger the room the more easily may these considerations be fulfilled, for by so much is the necessity for a frequent change lessened. Much will depend, too, upon the size of the inlets for air. Then, again, with the excess of carbonic acid we find a diminution of oxygen, and it is said that a loss of two or three parts of the latter in one hundred endangers life.

Without recapitulating the process by which the conclusions of the best sanitary authorities upon this subject have been reached, it is sufficient for present purposes to state the conditions which it has been agreed upon are required for perfect health:

1. That the limit of maximum impurity of air vitiated by respiration ought not to exceed six tenths (.6) of a volume per 1,000;

2. That to insure the maintenance of this standard, under ordinary circumstances, 3,000 cubic feet of pure air must be supplied for each person hourly;

3. That for this purpose, and with ordinary means of ventilation, a space of at least 1,000 cubic feet should be allowed per head in buildings permanently occupied.

These conditions are doubtless more exacting than most persons can afford. They apply to what ought to be and may be approximated as closely as circumstances permit. Many others neglect them because ignorant of their necessity. Of the poorer classes, however, observation will show that not more than 400 or 500 cubic feet of space are available, even in this country—frequently less—while in tenement houses, in cities, the allowance is often lamentably small. In California the law requires that provision be made for 500 cubic feet per person in sleeping apartments. It appears to have been intended originally to affect the crowded abodes in the Chinese quarter in San Francisco, and as the most available remedy for the insanitary influences arising therefrom. If enforced, it must be the means of providing better conditions in this one respect for this class than very many of the white population are able to secure.

In some of our cities, the living rooms of many families are upon the lower floor, in the rear of the store or other place of business—between it and the kitchen. These rooms are usually dark, without side windows, lighted by a skylight, and poorly ventilated by open doors, admitting a draft from front to rear. Such rooms, when entered from the open air, are close and disagreeable, making a profound impression upon the sense of smell, but the sickening odor, so noticeable by the visitor, appears to be uncomplained of by t

inmates, who spend most of their time within doors. In these close apartments, perhaps 18 feet wide, about 25 feet long, and 10 feet high, containing 4,500 cubic feet of space when empty of furniture, usually divided by partitions into three rooms, into which the purifying and invigorating rays of the sun seldom enter, families live and sleep, and children are reared. To make matters worse, lights must be provided, generally gaslights, and in the Winter season fires must be maintained. For the latter purpose, a small cooking stove is commonly used, with teakettle for boiling water, or, instead, the heat from the adjoining kitchen is utilized, the door leading thereto being left open, and the free entrance of the odors and vapors arising therefrom permitted.

In apartments of which the above is a fair type, many families live—consisting perhaps of seven or eight persons—and it is not difficult for the physician to trace an indirect connection between this mode of life and the diseases to which they are incident, and especially the slow and lingering character of maladies which, under better sanitary influences, tend to speedy recovery.

The air of dwellings is also deteriorated by *combustion*—by lights and fires. Oxygen is consumed, and carbonic acid produced. One cubic foot of coal gas consumes from two to two and a half cubic feet of oxygen, and produces from one to two cubic feet of carbonic acid. Candles and oil lamps also exert a deteriorating influence, but not to the same extent. Dr. Parkes states that the latter need not be considered in estimating the amount of fresh air required. The same authority estimates the carbonic acid consumed about twelve cubic feet during an evening of, say four hours, requiring the introduction of over twenty-one thousand cubic feet of air. It is generally advised, however, to provide a special channel, leading from the gas burners to a shaft in the wall adjoining the fire-flue, into which the products of combustion are passed. The flue or shaft is warmed by proximity to the chimney, and acts efficiently as a ventilator. Ornamental arrangements are described by which the conduction can be effected.

Then we have the ORGANIC MATTER in the air, constantly exhaled from the lungs and skin, giving rise to the nauseous odor of close, unventilated, or crowded apartments. From the bodies of the sick, especially those having contagious diseases, large quantities of such effete products are given off, requiring strict attention, and necessitating a larger air space, and the most efficient methods of ventilation.

WATERY VAPOR has been mentioned as another ingredient of air not without an important influence upon health, the amount of moisture depending upon temperature. The capacity of the air for moisture varies with its temperature. The higher the temperature, the greater the capacity. When the air is saturated with moisture at 40° Fahr., it can take up and hold 2.86 grs. of watery vapor; at 75° Fahr., it may contain 9.39 grs. Air containing only 2.86 grs. of vapor would be uncomfortably dry at 75° Fahr., while if the temperature were reduced to zero, there would be a surplus of moisture which would be deposited upon the walls and windows as *dew*. This principle is applied to the drying of damp and newly plastered rooms. By increasing the temperature by fires the capacity of the air for moisture is increased; it is taken up from the walls and carried off by ventilation. Generally, it is considered that from seventy to seventy-five per cent of moisture is most conducive to health and comfort.

Taking these several sources of impurity into consideration, it is not difficult to understand the importance of VENTILATION, the perplexing point being sometimes how to effect this without a too rapid interchange of air, and yet to maintain sufficient circulation and movement of diffusion around the occupants of the room to carry off the exhalations from the skin and lungs and other impurities. In the best dwelling houses, the size of the rooms and their arrangement will generally enable this to be accomplished by what is called *natural* ventilation. In the smaller rooms of the poor in tenement houses, and in many second-class hotels, the difficulties are greater.

NATURAL VENTILATION depends on those movements of the air set up by variations or inequalities of temperature, in accordance with the law regulating the diffusion of gases; the principle, as applied to the house, being, that when the air therein is warmer than that outside, the latter will rush in through all available inlets while the warm air of the interior escapes. This interchange of movement goes on until an equilibrium is established. The cracks or spaces around the windows and doors, and the chimney, are utilized for this purpose. The latter become efficient air-shafts, their ventilating power being heightened by the aspirating power of the winds upon their outlets; and this power may be much increased by cowls or other suitable arrangements on the top of the chimney. These, turning with the direction of the wind, maintain an active upward current, and prevent down-drafts, which are often the cause of smoky chimneys, unless proper inlets for fresh air are provided.

Inlets for fresh air and outlets for fresh air are essentially necessary. Their action depends upon the law just referred to—the difference in temperature between the air in the house and that outside. The warmer air of the house escapes, and the colder outside air rushes in—thus establishing an equilibrium.

The inlet should be so arranged as to cause the entering air to flow up to the ceiling, and thus be distributed without drafts. For this purpose, when practicable, windows should be placed at opposite sides of the room. The window, opening at the top, a board or strip of zinc may be attached obliquely upwards from the top sash; the air impinging against the board passes up towards the ceiling. Or wire gauze may cover the space left where the window is open, thus checking the velocity of the air, and finely dividing the current. (Parks and others.)

Various other contrivances have been adopted, as inserting double panes of glass in such a way that spaces may be left at the bottom of the outside pane and at the top of the inner one, thus forcing the incoming air to pass upward between the two.

As an outlet for foul air the chimney, with open fireplace, will generally prove efficient in ordinary dwellings. No room—no bedroom especially—ought to be without this old but useful convenience. In a sanitary point of view, it is also one of the best methods of warming the room; but it is expensive, on account of the waste of heat.

There are some other objections to it. As the fireplace is usually located, the warming is unequal; the air is hot near the fire and cold at a short distance; it "warms only one side of the body" at a time. Dr. Parkes says that the loss of radiant heat from a fire-place is as the square of the distance. If, at one foot distance from the fire, the

warming effect is equal to *one*, at four feet distance it will be sixteen times less. A large amount of heat, also, is carried up the chimney and lost, equal, it has been estimated, to six eighths or seven eighths of the total. The same objections hold, measurably, to the ordinary grate for burning coal, yet, in consequence of the smaller size of the open space above the fire, the escaping current of air is lessened. The objections are mainly economical. As a ventilator, it is invaluable. On that openings are often made in the chimney near the ceiling, materially aiding ventilation and carrying off the foul air of the upper part of the room.

"There is a source of ventilation quite as efficient as the opening of doors and windows, or the accidental openings that occur in buildings; it is a self-regulating supply of fresh air provided by diffusion through porous walls. We are unconscious of its operation, and though the amount supplied by passage through bricks and stone, even when plastered and papered, is very considerable, yet one cannot detect it by any sensation of draught." (Hartley, *Air in Relation to Health.*)

The subjects of ventilation and warming are too intricate to be thoroughly examined in an essay like the present, and, if exhaustively treated, would occupy more space than can be profitably allotted to it. My object has been to present, as clearly as such an abridgement of the subject would permit, a general outline of the principles involved.

WARMING.

A few general remarks on the subject of *heating* should be added in connection with ventilating. Dr. Parkes states that heat is communicated by radiation, conduction, and conversion. Practically the latter two may be regarded as the same. The open chimney, with its fireplace and grate, with a fire in it, affords a familiar example of the first, the heat radiating from the fire really warming, not directly the air in the room, but the solid materials upon which its rays fall—the furniture, the walls, and the bodies of those present—and through them the air in contact with them is warmed. A close heated stove acts upon the same principle.

Iron stoves, although they readily heat the room and much of their heat may be economized, an extension and proper arrangement of the pipe are, unless judiciously managed, open to objection. They are irregular in their action—rapidly heating and rapidly cooling—and, if allowed to become overheated, consume a portion of the oxygen in the carbonic acid present in the air, giving rise to the formation of an oxide (carbonic oxide) a highly poisonous gas. It is recommended that all such stoves be lined inside with fire-brick, thus preventing the overheating of the iron, and measurably overcoming the danger. The peculiar odor attaching to a room overheated by an iron stove, especially if there is deficient ventilation, is said to be due in part to this gas, and partly, perhaps, to the burning of the organic matter present in the air. For ventilating purposes, nothing is superior to the open fireplace.

Heating by pipes, conveying to different parts of the house heated air, admitted through movable openings or registers, and also by pipes conveying hot water or steam, has been adopted by many.

In the first, care should be taken that the heated air admitted is pure air—not such as is found in most uncemented cellars and base-

ments in which the heating apparatus is kept. The air used for heating should preferably be pure air introduced from the outside.

Of the different methods proposed—the mechanism of heating by hot water and by steam—it would be out of place here to speak. They are in many respects an advantage over other methods, especially over the iron stove. They are safe, cleanly, and give comparatively little trouble beyond the care necessary for their management. In the climate of California, where excessive cold is unknown, the apparatus being furnished, heating by hot water ought to be secured without great cost.

SEWER AIR.

The air of the house is also rendered impure by the gaseous emanations of sewers and cesspools.

In very many dwellings, planned and built with special reference to comfort and health, in location, convenience, and ventilation, the most unfortunate defects are often observed in drainage and in the arrangements required for the speedy and effectual removal of the waste products incident to human existence, and especially to the congregation of several individuals under one roof. Formerly, when the arrangements for the disposal of these products were all outside the house, when privies and cesspools were the only facilities afforded, and to these no drain from the house led, the principal dangers apprehended arose from the percolation of foul liquids and gases into the soil, thus exposing to the risk not alone of soil and air pollution, and the entrance of these into the house in the manner previously pointed out, but also to that of water pollution—the contamination of the well. That this latter danger is a real one, has been shown by many conclusive proofs. To this source, the origin of typhoid fever in a house or neighborhood has been clearly traced; and some other diseases of a fatal character are believed, upon what seems good evidence, to owe their communication to a similar cause. Partly for the purpose of avoiding these dangers, especially the pollution of the water supply, and partly for convenience in sickness and during inclement weather, the house system of drainage was adopted, water-closets were introduced, and the waste products from these carried away by drains and pipes to the place appointed for their final disposition.

Unfortunately these arrangements, however perfect in their construction and working, did not always result in banishing from use the cesspool and the evils attendant therefrom. The latter were still leaky, their liquid contents still percolated the soil, the wells were polluted as before, and foul air continued to be drawn up through the cellar into the living and sleeping rooms above. In cities where an abundant water supply is practicable, and sewers have been constructed to carry off to a proper receptacle the excreta and other waste from the houses, these dangers are avoided; but others scarcely less serious have been substituted. Badly constructed, imperfectly joined, insufficient in their drainage capacity, unventilated, and connected with equally faulty and unventilated drains leading to them from the house, they have but exchanged one evil for another, and, to such an extent that many have come to doubt whether the introduction of the water-carriage system has been altogether productive of good results. The objections, however, are not so much against the system itself as against its improper use. That it can be made to fulfill all

that in theory was ever claimed for it, that it has been the means of diminishing disease and lessening the death rate in cities, the highest authorities are fully agreed. Statistics from England where these improvements have been longest introduced, and where they have been managed under the most intelligent supervision, have conclusively demonstrated the fact of the intimate relation between the adoption of the water-carriage system and the diminution of certain diseases. In any sewerage system, the important point to be aimed at is the speedy removal of the excreta and liquid sewage from our dwellings, and to remove them in such a manner that the gases arising from their subsequent decomposition may not come back into the house to poison the air breathed by the inmates.

How to do this most effectually has been the subject of much scientific investigation, and the theme of many popular as well as standard publications. Yet it is one about which the great mass of the people, even those of admitted intelligence on other matters, are generally profoundly ignorant, and in the practical application of which the most palpable errors are daily witnessed.

Cesspools and privy vaults have been spoken of by almost all authorities, mainly by way of condemnation. Some of their principal evils have been pointed out in the preceding pages. There are, however, many cities and towns, and many isolated dwellings, even of the better class, where an abundant water supply and other conditions necessary to the successful working of the water-carriage system, are not available, and where even the dry earth method of removal is not readily applicable. There are other cities where no public sewerage system has been introduced, or, perhaps, only partially, to carry off the chamber, bath, kitchen, and sink waste—in other words, the liquid sewage. In such, cesspools or privy vaults, one or both, become a necessity, and, if properly constructed, they may be made not only tolerable but innocent.

They should be made water-tight, bricked up at the bottom and sides, and well cemented, as in making a cistern. They should be of such size and capacity as to render emptying necessary as often, at the least, as twice yearly. They should be ventilated from the top by a pipe or shaft running high up above the surface so as to carry off the foul air, generated within them, above the house windows. If well-water is used on the premises, they should be at least sixty or one hundred feet from the well, in order to guard against the possibility of leakage, and consequent defilement of the drinking water. They should also be as remote as possible from the dwelling. The privy vault should not be made the receptacle of the waste water of the house, but its contents should be kept as dry as possible.

While this much has been said concerning the admissibility of cesspools and privy vaults in localities where they seem unavoidable, they should only be tolerated under compulsion.

DRAINAGE.

Drainage will be spoken of as that limited system of pipes or conduits intended to convey away from the house the extra and other waste incident thereto. They may be either circular or oval, and should not be too large. Four inches is considered large enough for any private family. The scouring or self-cleaning capacity is, other being equal, greater in small than in large pipes. Such a pipe have a fall or slope of one inch in forty. They should be well

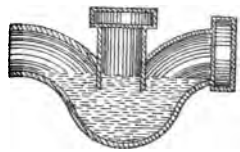
and evenly laid, the joint carefully cemented so as to prevent the possibility of leakage and the escape of their contents into the soil, and care should be taken to prevent the cement used for joining from being pressed inside the pipe, and thus offering an obstruction to the free current of sewage through them. It is advised to scrape off the surplus cement from the inside as each joint is laid.

Properly, no drain should enter the house; whether connected with sewers or cesspools it should terminate near to the base, but outside the house. Very often, the drain is seen to run through the house wall to receive the drainage in the cellar. But there is danger of foul air thus escaping into the house from the shrinkage of the cement about the joints, or from some unobserved imperfection of the pipes, or from breakage by reason of settling of the wall upon the drain. Should circumstances render it necessary to run the drain under the house, it is advised to guard it by an arch in the wall. The laying of drains is often carelessly done. In loose soils, they should be laid on concrete, or even on firm supports—piling—to prevent settling, and, if the distance to the sewer or cesspool is considerable, they should be provided at intervals with sections or joints capable of being opened for cleansing, or the removal of obstructions carelessly or accidentally admitted. Attention to these minutiæ may be the means of escaping much subsequent trouble and annoyance.

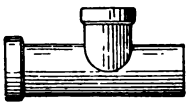
Proper arrangement should also be made for frequent *flushing*. By flushing is not meant the continuous supply of a small current of water, but the sudden discharge of a large volume carrying existing obstructions along with it.

It has just been said that no drain should enter the house; that is, that there should be no direct continuous line of drain from the sewer, or cesspool, to the water-closet, kitchen, sink, or bath-tub, or the pipes leading from these. The connection should be broken at the base of the house, outside, and at the foot of the soil-pipe. The object is to secure good ventilation of the drain into the open air, rather than through the soil-pipe into the house.

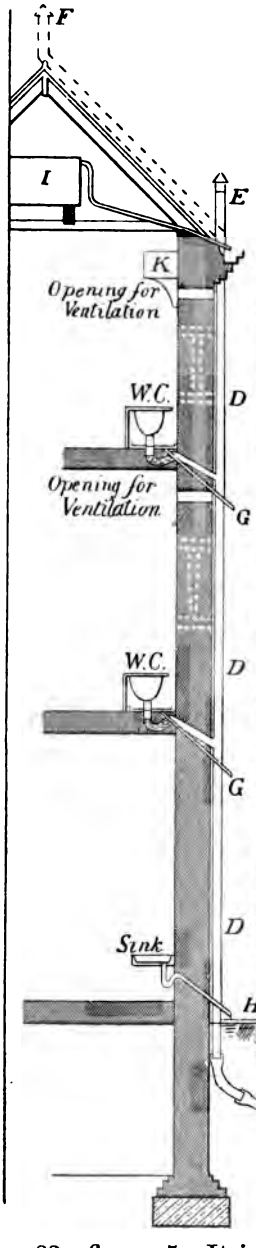
For soil-pipes, cast iron is the best material; it is cheaper and more durable than lead; it can be obtained of any desired size and form; it admits of tight jointing, so as to prevent the escape of sewer air. The joints are to be made with oakum and melted lead, the former being forced into the hub, the melted lead poured in, and then firmly calked so as to accurately and tightly fill the space. Iron soil-pipes are now made, having a smooth inside lining of porcelain. For ordinary dwellings, they may have a diameter of four inches. They should run up, as before stated, on the outside of the building.



The connection of the soil-pipe with the drain to the sewer should be by curved pipes, or those with oblique junctions. One oblique junction is shown in the figure. The "T" form, also used, cannot be too strongly condemned. Where used for water-closets, by a trap—figure 8—to prevent the entrance of sewer air, and for the further purpose of insuring a free circulation of air through the drain, an opening should be made in the latter between the house and the trap. By this opening, which is an inlet opening for fr[illegible]



air, a disconnection is effected between the air of the drain and the soil-pipe, ventilation of the former is secured, and a free circulation of fresh air through both.

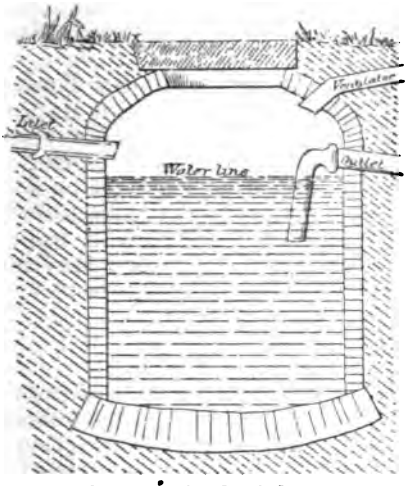


The opening may be covered with a grating, or when the soil from water-closets is to pass through, or there is danger of the foul air which escapes entering windows near by, a pipe may be run up above the roof of the house. The arrangement is well shown by Galton in his excellent work on "Healthy Dwellings," page 240—figure 50. Here "A" denotes the *trap* near the base of the house. "B" the inlet pipe to ventilate the drain and disconnect the latter from the soil-pipe "D," which extends above the highest part of the house. The same cut shows the utility of a covered drain-pipe above referred to. We have, therefore, both an inlet and an outlet for air. The soil-pipe serves as the latter; the former is well supplied by the disconnecting pipe "B." This may, as just stated, be also carried above the roof of the house.

The outlet, or soil-pipe, should be of equal diameter in its entire length, and without *elbow bends*, and the inlet, or disconnecting pipe, should equal in area the drain-pipe.

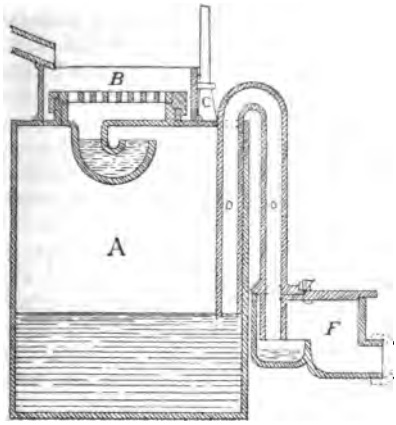
We have thus a ventilation of the soil pipe, a ventilation of the drain, and ventilation of the cesspool; or, if the drainage is into the public sewer, a *probable* ventilation of that also. I say probable, for it is to be supposed that the town authorities have taken care to provide for so necessary a measure. It is only by free ventilation that we can escape the danger of the passage of contaminated air.

For the bath, kitchen, and sink slops, which it may be here stated should be discharged separately from the excreta from the water-closet, a different arrangement may be made. The discharge pipes from all these should pass through to the outside of the house and empty into a disconnecting gully or grease tank, exposed to the open air, thence to flow to their ultimate destination. All such waste-pipes should be effectually trapped, near to the sink or bath from which they lead. A useful arrangement is found below, taken from the fifth report of the California State Board of Health, page 83—figure 5. It is admirably adapted for collecting and retaining grease from the kitchen sink, and thus preventing the clogging of the drain. It is surprising to what an extent this accident will happen, and the trouble and annoyance it occasions. By the outlet



pipe, which acts on the principle of a syphon, the clear water passes out into the drain, while the grease, being cooled, accumulates upon the surface. The inlet is observed to be about six inches above the surface of the sewage when the latter is sufficiently high to be acted upon by the syphon, and a ventilating pipe conveys any foul air above the roof of the building. Should grease get into the drain and obstruct it, or if the waste-pipe from the sink should be so obstructed, it may be best removed by boiling water to which an alkali, as sal soda, may be added; or by pouring boiling water over the outside of the drain in a continuous stream.

Another method of disposing of this kind of sewage is by means of what is called "Field's Flush Tank," and underground irrigation. The sewage is thus utilized as a fertilizer, as, indeed, it may be by the method just referred to. For this purpose, underground drain tiles are laid sufficiently deep to escape disturbance in cultivating the soil, with open joints, so as to permit the percolation of the liquid sewage. With land proportioned in quantity to that of the sewage to be applied, and sufficiently porous, the liquid may be properly and evenly distributed. Waring, and others, speak highly of this plan and recommend it as being entirely unobjectionable. The lines of drain pipe should be sufficiently near to each other to secure the uniform percolation of the sewage, ordinarily three or four feet apart. By "Field's Flush Tank" the discharge is automatic when the pump is full. Its action is, therefore, intermittent, filling the "ground for a short time and then, as the liquid subsides, fresh atmospheric air enters the soil and assists, by its oxidizing action, in the work of purification." The following plan and description of this tank are taken from Waring's "*Sanitary Drainage of Houses and Towns.*" (See Fig. 6.)



"It is made entirely of earthenware or cast iron. The liquids pass through the grating of the pan B, and are discharged through a trap that prevents the contained air of the vessel from escaping at the surface. C is a ventilating pipe to carry this contained air to the top of the house. A is a vessel holding a certain amount of water which has no escape except the siphon D. When the chamber is entirely filled, the pouring in of a few extra quarts of water, which is sure to occur some time during the day, brings the siphon into action, and it flows copiously

into the chamber, is empty to the depths below which solid matters are permitted to accumulate, to be occasionally cleared out on removing the pan B."

Rain-water pipes are often improperly used as ventilating shafts for drains or cesspools. This should not be allowed except under exceptional circumstances, for they are often unavailable for that purpose, as during heavy rains; and, at such times, their capacity being fully occupied, they are incapable of affording a free outlet for air. Such pipes should be used solely for their own specific purposes, and may be made to discharge independently into a trough, or upon the grating of a gully tank; or, as is often done, the water may be stored in a cemented cistern and utilized for domestic purposes.

DISPOSAL OF SOLID EXCRETA.

Various methods have been devised and adopted for the disposal of the solid excreta, each more or less adapted to the circumstances of different towns or localities. Thus we have the water-carriage system, the irrigation system, and the various forms and modifications of the dry-earth system. The first of these, or that by the use of indoor water-closets, when properly managed, recommends itself on account of convenience, especially to invalids or in inclement weather, cleanliness, efficiency, and safety. It demands a well-constructed apparatus, a free supply of water, secure plumbing, and a reasonable amount of care in its use and management.

Various forms of water-closets have been offered, the best being those of simple construction, not easy to get out of order, having a deep water-seal, and not liable to become foul by the adhesion of the solid excreta through them. These requisites will exclude that which is in most common use—the ordinary pan-closet. It consists, in general terms, of a bowl, closed below by a metal pan, so as to retain a quantity of water in the bowl, a receiver into which the contents of the bowl pass when the pan is lowered or tilted, and a trap. The action of the pan is controlled by a lever, one edge of the pan being lowered when the lever is lifted, permitting the excreta to pass in an oblique direction, thus striking against the side of the receiver. This being of cast-iron, with rough and unpolished surface, is liable to retain, by adhesion, a certain quantity of filth at each discharge from the bowl, and thus become, in time, the source of odors, not like those of "Arabie the blest," but rivaling the emanations of the drain or sewer itself. As a matter of fact, as the writer can testify from a personal experience with this closet not soon to be forgotten, it does become so befouled, causing an intolerable nuisance. Of late years this closet has been made with a porcelain lining, rendering it much less objectionable. The D trap, often connected with the pan-closet, should be discarded altogether, and an S trap substituted. It is now condemned by all sanitarians.

Of cheap closets, the hopper closet is simple in construction, not likely to get out of repair, and easily kept clean. It is provided with a trap, which supplies its only water-seal, and with an automatic valve-flushing apparatus, opened when the seat is pressed upon. This closet, made of crockeryware, or enameled, is generally regarded as the best of the cheap closets. It should have an abundant water supply, furnished automatically by a cistern.

Many other kinds of closets have been presented and are in com-

mon use. Some of them are known as "valve-closets," in allusion to the method adopted for discharge or outflow. Others are operated by a plunger or large plug, which retains the water when *in situ*, and permits its sudden discharge when raised. The Jennings and Pearson closets belong to the latter class. (See fig. 7, p. 80, and fig. 8, p. 81, fifth biennial California report; also, the Demorest, and others).

The Hillyer closet is a popular example of the *valve* closet. It is considered by Philbrick to be the best of its class. These closets are all somewhat expensive, but, properly cared for, do excellent service. They provide a deep water-seal, and a volume of water in the bowl sufficient to suddenly flush the trap and soil-pipe and carry off the excreta rapidly to their place of destination.

All closets require an abundant water supply. It should be regular and not subject to variation or interruption. For this purpose a tank or cistern should be provided, with a supply pipe of sufficient diameter to afford a free and rapid passage of water to the closet. If the tank for the water-closet is distinct from that supplying the family for drinking purposes, which it should always be, it is a mere matter of choice as to the material of which it is made. It should be light, durable, and capable of being made water-tight. In California it is customary to make them of galvanized iron. The same material will answer for the drinking water tank, but, as just stated, the latter must be entirely distinct from the former, as sewer gases from the closet, especially when the supply is controlled at the base of the tank and not at the closet, are constantly liable to reach and pollute the water in the cistern. Care must also be taken that the overflow pipe from the drinking water tank does not connect with a soil-pipe or drain. It may discharge independently at the side of the house or into the rain-water pipe, or over an open gully.

The trap of the water-closet should be ventilated by a pipe leading from its upper surface to the open air, or to the soil-pipe above the connection of the uppermost water-closet when there are more than one, and care should be taken by those who use the closet to prevent the entrance of any substance likely to obstruct it. Even the best closets are liable to get out of order unless properly cared for. A good closet, with its trap well ventilated, is not likely to become unsealed except by evaporation when long unused; and in the plunger closets, with a good air vent, even this is not likely to occur, as when the water disappears from the bowl, the float will fall, and opening the valve, allow the deficiency to be supplied.

When two or more closets are to be provided, one for each story, they should be placed on the same line, one above the other, and connected with the same soil-pipe. Each should have its own water cistern and its own ventilating pipe running from the trap to the open air, or, as before suggested, into the soil-pipe above the uppermost water-closet.

Water-closets should never be placed in a bedroom or in a room opening into a bedroom. They should be located in an apartment set apart for this purpose, against an outer wall of the house, capable of being well ventilated by an open window, admitting both fresh air and sunlight; or, better still, in an *annex* to the house connected therewith by a short ventilated passage-way, to be entered from the house by a door which is to be kept closed.

The construction and arrangement of the soil-pipe, its disconnection from the sewer by a trap and an inlet opening for fresh air

between the trap and the foot of the soil-pipe, have already been fully explained.

In the absence of the necessary water supply to make the water-carriage system available, the privy with its many objectionable features may still be avoided by the adoption of the "dry-earth" system in one of its several forms. In principle, this method depends upon the deodorizing properties of dry-earth, which are known to be efficient for this purpose. Mr. G. E. Waring has detailed the advantages of the "Moule closet," which belongs to this system, briefly as follows: "A comfortable closet on any floor of the house, supplied with earth and cleansed of its deposits without the intervention or knowledge of any member of the household; a portable commode in any dressing-room, bedroom, or closet, the care of which is no more disagreeable than that of an ordinary fireplace; appliances for the use of immoveable invalids which entirely remove the distressing accompaniments of their care, and the complete and effectual removal of all the liquid wastes of sleeping-rooms and kitchen and the complete suppression of the odors which, despite the comfort and elegance of modern living, still hang about our cesspools and privy vaults and attend the removal of their contents."

Any good dry earth, free from gravel or other non-absorbent particles, will answer. About one and one half pounds, or, by measure, one and one half pints of dry soil or ashes, will be required to deodorize each deposit. The mechanism by which the arrangement is worked is described in general terms, of a wooden box with a hopper above to hold a quantity of earth, and what is called a "chucker," which is tilted forward when the handle is raised (as in water-closets to admit water), and empties a definite quantity of earth into the hod or bucket under the seat; the latter is removed at stated intervals (every twenty-four hours), and replaced by another clean bucket. There are many modifications of the above plan, some adapted for outdoor use. They have not been generally favorably received in the United States, at least as applicable to large towns. The quantity of earth required (roughly one and one quarter tons daily for each one thousand inhabitants) would prove a serious difficulty, not to mention the cost of daily supervision and removal. For private families in the country, for public institutions, jails, prisons, and the like, their adaptation is generally admitted.

The product of the system dried forms an excellent fertilizer, free from any objectionable features.

To discuss the irrigation system is beyond the scope of this paper.

In the preceding pages the attempt has been made to divest the subjects treated of as far as possible of technicalities, and to adapt them to the comprehension of the non-professional reader. The object has been to supply some practical information upon matters which concern every householder, and which, it is believed, have been too generally neglected. No claim to originality is set up, but the effort has been made to combine and condense the views of the best authorities, not generally accessible to the popular reader, in such a manner as to awaken attention to the subject, and thus lead to the correction of prevalent errors.

Among the works consulted are: Buck's "Hygiene," Parke's "Principles of Hygiene," Galton's "Healthy Dwellings," Philbrick's "American Sanitary Engineering," Waring's "Sanitary Drainage, etc.," Pettenkofer's "Air in Soil," and others.

REPORT OF COMMITTEE ON THE SALUBRITY OF PUBLIC INSTITUTIONS, SCHOOLS, HOSPITALS, PRISONS, AND FACTORIES.

The undersigned, to whom was assigned the task of gathering the information desired by the said committee, finds the work embraces a wider field than present opportunities for investigation and personal observation permits.

Circular letters were sent to all the orphan asylums in the State receiving pecuniary aid. These letters, being addressed to the superintendent of each institution, were designed to elicit information concerning the sanitary location and general arrangement of the schools.

The following asylums responded to the inquiries proposed in said letters:

1. Good Templars' Home, Vallejo ..... Non-sectarian
2. Grass Valley, Nevada County ..... Sisters of Mercy
3. Pajaro Valley Orphan Asylum, Watsonville ..... Franciscan Fathers
4. Ladies' Protection and Relief Society ..... Protestant
5. Ladies' Relief Society, Oakland ..... Non-sectarian
6. Home of Benevolence, San José ..... Non-sectarian
7. Santa Cruz Female Orphan Asylum, Santa Cruz ..... Roman Catholic
8. St. Joseph's Institute, San Juan South ..... Roman Catholic
9. Almshouse, San Francisco ..... Non-sectarian

Circular letters were sent to nineteen asylums, each one the recipient of pecuniary aid from the State. Ten only returned answers to the letters.

The table annexed exhibits a highly satisfactory sanitary condition of these institutions, sustained in part by State aid. The general management excellent; educational facilities unexceptionable. The exemption from the diseases of childhood in these schools, located in different sections of the State, speaks well for the salubrity of our climate.

The whole number of inmates in the nine schools reported, as per table, 959; whole orphans, 246; half orphans, 436; abandoned children, 21. Scarlatina, measles, diphtheria, dysentery, or typhoid fever, did not prevail in any of the schools during the past year. Two sporadic cases, in the Good Templars' Home, of diphtheria, two of dysentery, and six typhoid fever. In the same school, two deaths—one typhoid fever, and one pneumonia. In Ladies' Relief Society there were twenty cases of whooping cough, and in the Ladies' Protestant Society seventy cases. All made full and successful recoveries.

Dr. Orme, of Los Angeles, reports on the Los Angeles County Hospital; Dr. C. M. Fenn, of San Diego, reports on the public institutions in San Diego County; Dr. Orme also reports on the Branch State Normal School in Los Angeles. John Hall, Esq., sanitary engineer and architect, Los Angeles, kindly gave Dr. Orme a paper on "Sanitary Science," and also reports, by request, on the Branch State Normal School, Los Angeles. These reports are justly entitled to the careful consideration of the State Board of Health—developing much

valuable information in sanitary matters, and many useful suggestions in the erection of public buildings.

Not obtaining any positive information from the hospitals, prisons, factories, etc., within the State, I cannot offer any report on their condition.

J. M. BRICELAND, M.D.,
Chairman of Committee.

Name and Location.	Religion.	Number of Inmates	Whole Number of Orphans	Half Orphans	Between Ages Admitted	Course of Instruction	Scarlatina	Measles	Diphtheria	Dysentery	Typhoid Fever	Number of Deaths	Cause of Death
St. John's Institute, San Juan South	Roman Catholic		3	50	4 and 14	English, Spanish, Music							
Santa Cruz Female Orphan Asylum, Santa Cruz	Roman Catholic	76	10	27	All ages	English course						1	Consumption
Home of Benevolence, San José	Non-sectarian	44	1	28	3 and 12	English course							
Ladies' Protection and Relief Society *	Non-sectarian	238	16	122	2 and 11	Public School course							
Ladies' Relief Society, Oakland †	Non-sectarian	66	15	28	2 and 12	Public School course							
Pajaro Valley Orphan Asylum, Watsonville	Franciscan Fathers	96	20	76	6 and 12	Public School course							
Grass Valley, Nevada County, California ‡	Sisters of Mercy	259	168	91	10 m. to 13 y'rs.	Primary to graduating							
Almshouse, San Francisco ⁂	Non-sectarian	36	1	14	Any age	Primary to graduating							
Good Templars' Home, Vallejo	Non-sectarian	144	12	132	1½ to 12	Primary to graduating			2	2	6	2	Typhoid Pneumonia

Name and Location.	Religion.	Source of Water Supply	Character of Water	Distance from Privy or Cesspool	System of Drainage	Discharge Pipes Properly Tapped	Provision for Ventilation	Superintendent.
St. John's Institute, San Juan South	Roman Catholic	Well	Pure	Far off	Pipes to cistern	Yes	Yes	Sister C. Argelaga
Santa Cruz Female Orphan Asylum, Santa Cruz	Roman Catholic	City water	Good	100 feet	Sewer to creek	Yes	Yes	Sister R. Genevieve
Home of Benevolence, San José	Non-sectarian	Artesian well	Pure	40 rods	To street sewer	Yes	Yes	Mrs. Wiswell
Ladies' Protection and Relief Society	Non-sectarian		Pure		To street sewer	Yes	Yes	Jessie Campbell
Ladies' Relief Society, Oakland	Non-sectarian		Good		To street sewer	Yes	Yes	M. J. Jackson
Pajaro Valley Orphan Asylum, Watsonville	Franciscan Fathers		Good	800 feet	Sewer to lake	Yes	Yes	Rev. F. Condine
Grass Valley, Nevada County, California	Sisters of Mercy	Artesian well	Good	500 feet	Sewers	Yes	Yes	Sister M. Gabriel
Almshouse, San Francisco	Non-sectarian	Spring Valley			Sewers	Yes	Yes	M. J. Keating
Good Templars' Home, Vallejo	Non-sectarian			500 feet	Sewers	Yes	Yes	N. Smith

* Whooping cough, seventy cases.
† Whooping cough, twenty cases.
‡ One case of croup.
⁂ Abandoned, twenty-one.

LOS ANGELES COUNTY HOSPITAL.

[Reported by H. S. Orme, M.D.]

A thorough investigation of the County Hospital building shows that institution to be in a good sanitary condition.

In its adaptability for the purposes for which it is designed, the building is somewhat faulty in construction.

The building is a substantially built two-story frame building, about two miles from the business part of the city, on the main traveled road leading to San Gabriel. The location of the building is such that it receives all the dust flying from a road on which the traffic is heavy—a matter of no little importance to the health of many of the patients.

It is to be regretted that some other plan had not been adopted in the building of the structure, as the best sanitary engineers now favor plans wholly unlike the one on which this has been constructed. Had the building been one-story in height instead of two; had small and inexpensive cottages, connected by corridors, been erected; had the sick wards been in buildings separate from the kitchen, dining-room, and offices; and had special buildings been provided, especially adapted for the treatment of lung diseases, and for those diseases requiring special treatment, much more could have been done for the comfort and safety of the inmates than has been done.

The halls, wards, kitchen, dining-room, water-closets, and other rooms were examined in detail. These rooms are new and ventilated by open windows and doors. The closets in the building are in a good sanitary condition. The supply of water is adequate and its quality as good as any supplied by the city waterworks. The presence of water-closets in the building is objectionable, and the closets should not be used except in imperative cases. The condition of the larger closet, out of doors, is good, but might be improved.

The dairy, in charge of the farmer, is not what it should be; on the contrary it was, at the time of our inspection, intolerably bad.

The dead-house, a wooden structure, should be replaced by one of brick.

Los Angeles, June 18, 1884.

Dr. H. S. Orme:

Dear Sir: The following is the report of deaths in the County Hospital from May 1, 1883, to May 1, 1884. You will see that a large proportion of these were from consumption, and probably not one of the number contracted the disease in this country; many of them coming directly from the East, and dying in a short time after their arrival. Those marked from old age are nearly all native Californians, brought to the hospital in their last days to die. The cases of dropsy were really alcoholism, which terminated in dropsy. Some of the deaths were from disease incidental to the climate, or from local cause.

Total number treated, 370; total deaths, 48. Consumption, 18; fever, 3; old age, 9; dropsy, 6; asthma, 2; heart disease, 1; diarrhœa, 1; alcoholism, 2; wounds, 2; unknown, 3.

BRANCH STATE NORMAL SCHOOL, LOS ANGELES, CALIFORNIA.

[Report by H. S. Orme, M.D., Member State Board of Health.]

The Branch State Normal School is situated about three fourths of a mile west of the central or main business part of the city, on a hill about fifty feet above the level of Main Street, and about three hundred and fifty feet above the sea level. It is on a tract of eight acres, formerly known as Bellevue Terrace, a beautiful orange orchard, and lies at the head of Fifth Street, and between Charity and Flower Streets.

It is a three-and-a-half-story brick building, T-shaped, and surmounted by a tower in front, the top of which commands a fine view. The ground story contains three rooms for the training school, three small recitation rooms, a laboratory, two boiler rooms, water-closets, wash-room, and Janitor's rooms. The next story contains the offices of Principal and Preceptress, the library, four recitation rooms, two cloak rooms, and a small room for apparatus. The third story contains a large assembly room, four recitation and two cloak rooms, while above the latter is one large and two small rooms intended for museum purposes. The walls are hard finished, and the wood work cedar and redwood, oil finished on the second and third floors and painted on the others. The building seems well built and of good material, well supplied with daylight, and also supplied with inside blinds to protect against the excess of sunlight, and in general well adapted to its purpose.

In general all doors in the building open *inward*. Of the two main and four subordinate entrances, five open *inward*, while the sixth, the main entrance, is closed by sliding doors. I am informed that this violation of the fire ordinance was pointed out more than a year ago, but thus far without effect.

The western end of the main hall on the ground floor has no outlet, a serious defect in case of fire or panic. The stairways, four feet wide, have been criticised on the same ground. The two flights of steps leading up to the main entrance have very narrow risers and narrow steps, are especially liable to cause stumbling, and therefore ill adapted to their purpose.

Sufficient attention in the construction of the building has not been paid to ventilation, reli-

ance having been placed wholly upon the amount of cold air which would enter spontaneously through open doors or windows. The only provision that has been made for getting rid of foul air is by opening the interior doors, except in the case of the main assembly room.

The building is heated by means of coal stoves placed in the various rooms. Two rooms were set apart in the construction of the building for boilers, with a view to heating by steam, but thus far no steps have been taken towards carrying out this plan.

It is lighted for evening use with kerosene lamps. For a short time the assembly room was lighted with the electric light. Gas pipes were put into the building at the time of its erection, but thus far no connection has been made with the city gas mains, and the building is without gas fixtures.

The subject of water supply is a tender one, as it has been a subject of complaint and of controversy. (See Los Angeles *Daily Times*, September 27 and 29, 1883.) And I cannot persuade myself that the fault-finding has been wholly groundless.

When first erected, in 1882, the building was supplied with water from the Beaudry waterworks. On account of the expense a change was made in about October, 1882, and water obtained from the city waterworks. On account of the height of the hill and building the pressure from the city main was only sufficient to supply the ground floor tolerably, the first or main floor very feebly and intermittently, and the third floor not at all. This was the condition of things during 1882–3. In the midsummer vacation of 1883 another change was made, and water obtained from an open ditch or zanja, used by a woolen mill as a source of power.

The ordinary pressure of water from the mill is sufficient to supply the ground floor fairly, but, I believe, no floor above. To overcome this two large tanks were constructed in the top of the building, and these, from time to time, were filled by the pumps at the woolen mill, and were used as a reserve to draw on.

Now, the only supply of water in the building at the present time is this ditch water, which is more or less impregnated with salts and organic matter. It is intended for use in the water-closets, in the wash-basins, the laboratory, and in case of fire.

For drinking purposes one faucet is placed under the main entrance stairway, from which *city water* may be had, this being the only city water available at the building. No provision is made for straining or filtering it. This faucet has been much but not exclusively patronized, as it is not uncommon to see the children drinking ditch water from other faucets. Under this arrangement the water supply appears to have been entirely inadequate. For nearly two thirds of the year a continuous flow of water has been available on the ground floor only. During about one half the year there has been a feeble and intermittent flow on the first or main floor.

During this time from three hundred to four hundred pupils have been in attendance at the school, making constant use of its six water-closets, two of which were frequently without water. These two were afterwards closed. Two were supplied with water under low pressure most of the time, and were in constant use. These two adjoin recitation rooms in constant use. The remaining two closets on the ground floor were fully supplied with water under a twelve to fifteen feet pressure, except for one or two short intervals during excessively hot weather. These two closets were used by the three hundred and fifty pupils in attendance during two thirds of the year.

I am also informed that during the year the building has been without adequate protection against fire, owing first to the feeble pressure of water, and second to the absence of hose and fire nozzles; the latter have been recently added, and now there are two sections of hose, with nozzles attached, on each of the three floors. The building is not provided with any fire escapes or patent extinguishers.

Intimately connected with the water supply is the matter of sewage. During the year 1882–3 the sewage was led to a cesspool in the front of the building, and the overflow drained off into the grounds. Later the city laid sewer pipe on Fifth Street, and connection was then made with it. The connection was, however, very shabbily made, and leaked from the very first day. After some months the whole of the connecting pipe was taken out and replaced by new, which appears to be satisfactory.

The building has been well and cleanly kept. Considerable attention also has been given to the grounds, but with indifferent results during most of the year. The main approach to the building is in a very unsatisfactory condition, there being not even a tolerable pathway except in dry weather.

Since the above report was written the building has been carefully examined, at my request, by Mr. John Hall, an English architect and sanitary engineer of twenty years' experience. He condemns the sanitary condition of the building in very strong terms, particularly with reference to its ventilation.

OFFICE OF THE STATE BOARD OF HEALTH, SACRAMENTO, CAL., June 30, 1884.

To Superintendent of Good Templar Society Orphan Asylum:

The undersigned having been assigned by the State Board of Health the duty of making a report upon the condition of the public institutions of the State, including the asylums for orphans and half-orphans, submits the following questions for your consideration, to which he respectfully asks the favor of an early reply. Any other facts or suggestions not necessarily

elicited by the questions propounded, which you consider of interest in their relation to the institution under your charge, will be acceptable to the committee.

Very truly yours,

J. M. BRICELAND, M.D.,
Chairman Committee on Public Institutions, etc.

1. Name and location? Good Templars' Home for Orphans, Vallejo.
2. By what religious denomination conducted?
3. Present number of inmates? One hundred and forty-four. (a) Boys? Eighty-two. (b) Girls? Sixty-two.
4. Number of *whole* orphans? Twelve.
5. Number of *half* orphans? One hundred and thirty-two.
6. Between what ages are children admitted? One and one-half and twelve.
7. Are the playgrounds separate for boys and girls or in common? Separate.
8. How many pupils connected with the school? One hundred and twelve.
9. How many non-resident pupils admitted? Thirty-six.
10. Amount paid for tuition by non-residents?
11. Course of instruction? Common school—spelling, reading, writing, arithmetic, geography, grammar, etc.
12. Size of school-room—length, width, and height? Twenty-eight feet square; fourteen feet high; four rooms.
13. Method of ventilation? By flue leading from floor and lowering of sash.
14. Number of dormitories? Nine.
15. Size of each—length, width, and height? One 18 x 30, 14 feet high, contains 11 beds, 22 children; one 20 x 27, 14 feet high, contains 6 beds, 12 children; one 20 x 30, 14 feet high, contains 6 beds, 12 children; one 20 x 24, 14 feet high, contains 6 beds, 12 children; one 20 x 24, 15 feet high, contains 14 beds, 28 children; one 21 x 30, 20 feet high, contains 13 beds, 26 children; one 20 x 26, 15 feet high, contains 3 beds, 5 children; one 21 x 30, 16 feet high, contains 22 single cribs, 22 children; one 16 x 16, 16 feet high, contains 5 single cribs, 5 children; total number of children, 144.
16. Number of beds in each?
17. Number of children occupying each ward? Twenty-two, twelve, twelve, twelve, twenty-eight, twenty-six, five, twenty-two, and five respectively.
18. Have any of the following diseases occurred during the past year, and if so, how many of each? (a) Scarlatina? None. (b) Measles? None. (c) Whooping-cough? None. (d) Diphtheria? Two. (e) Typhoid fever? Six. (f) Dysentery? Two.
19. How many deaths have occurred? Two.
20. From what cause? Pneumonia one, typhoid fever one.
21. What is the source of the water supply? Vallejo city waterworks, well, and cistern.
22. What is the character of the water? Good.
23. If the source is from a well, at what distance from the latter is the cesspool or privy? About 500 feet.
24. Are water-closets used? Yes.
25. Where are their contents discharged? Cesspools.
26. What system of drainage has been adopted, both for these and other household sewage? Underground sewer-pipes.
27. Have the discharge pipes leading from the interior of the house to cesspools, drains, or sewers, been properly *trapped?* Yes.
28. Has any provision been made for their ventilation? Yes.

N. SMITH, Superintendent.

OFFICE OF THE STATE BOARD OF HEALTH, SACRAMENTO, CAL., June 30, 1884.

To Superintendent of Grass Valley Orphan Asylum:

The undersigned having been assigned by the State Board of Health the duty of making a report upon the condition of the public institutions of the State, including the asylums for orphans and half-orphans, submits the following questions for your consideration, to which he respectfully asks the favor of an early reply. Any other facts or suggestions not necessarily elicited by the questions propounded, which you consider of interest in their relation to the institution under your charge, will be acceptable to the committee.

Very truly yours,

J. M. BRICELAND, M.D.,
Chairman Committee on Public Institutions, etc.

1. Name and location? Grass Valley, Nevada County, California.
2. By what religious denomination conducted? Sisters of Mercy.
3. Present number of inmates? (a) Boys? One hundred and sixty-nine. (b) Girls? Ninety.
4. Number of *whole* orphans? One hundred and sixty-eight.
5. Number of *half* orphans? Ninety-one.
6. Between what ages are children admitted? Ten months and thirteen years.

7. Are the playgrounds separate for boys and girls, or in common? Separate. One half mile apart.
8. How many pupils connected with the school? About three hundred.
9. How many non-resident pupils admitted? Any number admitted; about thirty attend.
10. Amount paid for tuition by non-residents? Two dollars per month and free.
11. Course of instruction? From primary school to graduating class.
12. Size of school-room—length, width, and height? Five school-rooms and three class-rooms. Principal, 48x38, 45x30.
13. Method of ventilation? Windows, doors, transoms, ventilation pipes.
14. Number of wards or dormitories? Four large dormitories; nine small.
15. Size of each—length, width, and height? From 60x40 to 50x36. Height, 16 feet. Small dormitories, 20 x 20 x 25 x 15 x 16.
16. Number of beds in each? From forty-two to eight.
17. Number of children occupying each ward? From forty-two to four.
18. Have any of the following diseases occurred during the past year, and if so, how many of each? (a) Scarlatina? None. (b) Measles? None. (c) Whooping-cough? None. (d) Diphtheria? None. (e) Typhoid fever? None. (f) Dysentery? None.
19. How many deaths have occurred? One.
20. From what causes? Croup.
21. What is the source of water supply? Town reservoir for flushing, and well for drinking.
22. What is the character of the water? Very best.
23. If the source is from a well, at what distance from the latter is the cesspool or privy? Five hundred feet.
24. Are water-closets used? Yes.
25. Where are their contents discharged? By sewerage, which carries contents into creek about six hundred rods from dwelling.
26. What system of drainage has been adopted, both for these and other household sewage? Tiles and planking.
27. Have the discharge pipes leading from the interior of the house to cesspools, drains, or sewers, been properly *trapped?* Yes.
28. Has any provision been made for their ventilation? Air pipes or chimneys.

SR. M. GABRIEL MULLIGAN, Superintendent.

OFFICE OF THE STATE BOARD OF HEALTH, SACRAMENTO, CAL., June 30, 1884.

To Superintendent of Pajaro Valley Orphan Asylum:

The undersigned having been assigned by the State Board of Health the duty of making a report upon the condition of the public institutions of the State, including the asylums for orphans and half-orphans, submits the following questions for your consideration, to which he respectfully asks the favor of an early reply. Any other facts or suggestions not necessarily elicited by the questions propounded, which you consider of interest in their relation to the institution under your charge, will be acceptable to the committee.

Very truly yours,

J. M. BRICELAND, M.D.,
Chairman Committee on Public Institutions, etc.

1. Name and location? Pajaro Valley Orphan Asylum, Watsonville.
2. By what religious denomination conducted? Franciscan Fathers.
3. Present number of inmates? (a) Boys? Ninety-six. (b) Girls? None.
4. Number of *whole* orphans? Twenty.
5. Number of *half* orphans? Seventy-six.
6. Between what ages are children admitted? Six and twelve years of age.
7. Are the playgrounds separate for boys and girls, or in common? One playground.
8. How many pupils connected with the school? Ninety-six.
9. How many non-resident pupils admitted? One.
10. Amount paid for tuition by non-residents? Nothing.
11. Course of instruction? Reading, writing, arithmetic, geography.
12. Size of school-room—length, width, and height? Two school-rooms—No. 1, 28 x 30 x 13; No. 2, 20 x 30 x 13.
13. Method of ventilation? Large windows in each side.
14. Number of wards or dormitories? Four.
15. Size of each—length, width, and height? Nos. 1 and 2, 28 x 30 x 11; No. 3, 50 x 24 x 11; No. 4, 34 x 12 x 12.
16. Number of beds in each? Nos. 1 and 2, 25 each; No. 3, 29; No. 4, 11; rest in private rooms.
17. Number of children occupying each ward? The same as the beds.
18. Have any of the followiug diseases occurred during the past year, and if so, how many of

each? (a) Scarlatina? None. (b) Measles? None. (c) Whooping-cough? None. (d) Diphtheria? None. (e) Typhoid fever? None. (f) Dysentery? None.

19. How many deaths have occurred? None.
20. From what causes? No cause.
21. What is the source of the water supply? A well.
22. What is the character of the water? Good.
23. If the source is from a well, at what distance from the latter is the cesspool or privy? Eight hundred feet.
24. Are water-closets used? Yes.
25. Where are their contents discharged? Into a lake.
26. What system of drainage has been adopted, both for these and other household sewage? Wooden flumage.
27. Have the discharge pipes leading from the interior of the house to cesspools, drains, or sewers, been properly *trapped?* Yes.
28. Has any provision been made for their ventilation? Yes.

REV. FRANCIS CODINA, Superintendent.

OFFICE OF THE STATE BOARD OF HEALTH, SACRAMENTO, CAL., June 30, 1884.

To Superintendent Ladies' Relief Orphan Asylum:

The undersigned having been assigned by the State Board of Health the duty of making a report upon the condition of the public institutions of the State, including the asylums for orphans and half-orphans, submits the following questions for your consideration, to which he respectfully asks the favor of an early reply. Any other facts or suggestions not necessarily elicited by the questions propounded, which you consider of interest in their relation to the institution under your charge, will be acceptable to the committee.

Very truly yours,

J. M. BRICELAND, M.D.,
Chairman Committee on Public Institutions, etc.

1. Name and location? Ladies' Protection and Relief Society.
2. By what religious denomination conducted? Non-sectarian; managers elected from all Protestant churches.
3. Present number of inmates? Two hundred and thirty-eight. (a) Boys? One hundred and fifteen. (b) Girls? One hundred and seven. Sixteen employés.
4. Number of *whole* orphans? Sixteen.
5. Number of *half* orphans? One hundred and twenty-two.
6. Between what ages are children admitted? Between two and eleven years of age.
7. Are the playgrounds separate for boys and girls, or in common? Separate.
8. How many pupils connected with the school? One hundred and one boys and ninety-two girls. Total, one hundred and ninety-three.
9. How many non-resident pupils admitted? One.
10. Amount paid for tuition by non-residents? Nothing.
11. Course of instruction? Same as in public schools.
12. Size of school-room—length, width, and height? Four school-rooms, large and airy.
13. Method of ventilation? Plenty of windows, etc.
14. Number of wards or dormitories? Three wards, besides small rooms.
15. Size of each—length, width, and height? Vary in size; height, eleven feet; all large and well ventilated.
16. Number of beds in each? Two hundred and ten beds in all.
17. Number of children occupying each ward? Fifty in the first; one hundred and five in the second; sixty-five in the fourth.
18. Have any of the following diseases occurred during the past year, and if so, how many of each? (a) Scarlatina? None. (b) Measles? None. (c) Whooping-cough? Seventy cases. (d) Diphtheria? None. (e) Typhoid fever? None. (f) Dysentery? None.
19. How many deaths have occurred? Not any.
20. From what causes?
21. What is the source of the water supply? Supplied from city hydrants.
22. What is the character of the water? Generally good.
23. If the source is from a well, at what distance from the latter is the cesspool or privy?
24. Are water-closets used? Two (outside).
25. Where are their contents discharged? Into the street sewer.
26. What system of drainage has been adopted, both for these and other household sewage? Ironstone pipes connecting with the street sewer.
27. Have the discharge pipes leading from the interior of the house to cesspools, drains, or sewers, been properly *trapped?* Yes.
28. Has any provision been made for their ventilation? No pipes above the roof but the ordinary ventilation in good houses.

MARY L. JACKSON, Corresponding Secretary.

OFFICE OF THE STATE BOARD OF HEALTH, SACRAMENTO, CAL., June 30, 1884.

To Superintendent Ladies' Relief Society Orphan Asylum:

The undersigned having been assigned by the State Board of Health the duty of making a report upon the condition of the public institutions of the State, including the asylums for orphans and half-orphans, submits the following questions for your consideration, to which he respectfully asks the favor of an early reply. Any other facts or suggestions not necessarily elicited by the questions propounded, which you consider of interest in their relation to the institution under your charge, will be acceptable to the committee.

Very truly yours,

J. M. BRICELAND, M.D.,
Chairman Committee on Public Institutions, etc.

1. Name and location? Ladies Relief Society, of Oakland, California.
2. By what religious denomination conducted? All denominations.
3. Present number of inmates? Sixty-six. (a) Boys? Thirty-nine. (b) Girls? Twenty-seven.
4. Number of *whole* orphans? Fifteen.
5. Number of *half* orphans? Twenty-eight.
6. Between what ages are children admitted? Between ages of two and twelve.
7. Are the playgrounds separate for boys and girls, or in common? In common.
8. How many pupils connected with the school? Forty-seven attend public school, nineteen the nursery school, at the Home.
9. How many non-resident pupils admitted?
10. Amount paid for tuition by non-residents?
11. Course of instruction? Public school.
12. Size of school-room—length, width, and height? Fifteen by twenty-five by fifteen.
13. Method of ventilation? By ventilators and windows.
14. Number of wards or dormitories? Five dormitories.
15. Size of each—length, width, and height? Two new ones, fifty by thirty feet, the others smaller.
16. Number of beds in each? Fifteen in the smaller; others not yet occupied.
17. Number of children occupying each ward? A child in each bed.
18. Have any of the following diseases occurred during the past year, and, if so, how many of each? (a) Scarlatina? (b) Measles? (c) Whooping-cough? Twenty. (d) Diphtheria? (e) Typhoid fever? (f) Dysentery?
19. How many deaths have occurred? None.
20. From what causes?
21. What is the source of water supply? Well and city water.
22. What is the character of the water? Pure.
23. If the source is from a well, at what distance from the latter is the privy? Forty rods; a creek, forty rods distant, answers for cesspool.
24. Are water-closets used? Yes.
25. Where are their contents discharged? Into the creek.
26. What system of drainage has been adopted, both for these and other household sewage? Traps, ventilators, hoppers, etc.
27. Have the discharge pipes leading from the interior of the house to cesspools, drains, or sewers, been properly *trapped?* All have been newly trapped of late.
28. Has any provision been made for their ventilation? Ample provision.

JESSIE CAMPBELL,
Corresponding Secretary Ladies' Relief Society of California.

OFFICE OF THE STATE BOARD OF HEALTH, SACRAMENTO, CAL., June 30, 1884.

To Superintendent of Home of Benevolence Orphan Asylum:

The undersigned, having been assigned by the State Board of Health the duty of making a report upon the condition of the public institutions of the State, including the asylums for orphans and half-orphans, submits the following questions for your consideration, to which he respectfully asks the favor of an early reply. Any other facts or suggestions, not necessarily elicited by the questions propounded, which you consider of interest in their relation to the institution under your charge, will be acceptable to the committee.

Very truly yours,

J. M. BRICELAND, M.D.,
Chairman Committee on Public Institutions, etc.

1. Name and location? Home of Benevolence, San José, California.
2. By what religious denomination conducted? Unsectarian.
3. Present number of inmates? Forty-four. (a) Boys? Twenty-three. (b) Girls? Twenty-one.

4. Number of *whole* orphans? One.
5. Number of *half* orphans? Twenty-eight.
Parents separated? Fifteen.
6. Between what ages are children admitted? Three and twelve years.
7. Are the playgrounds separate for boys and girls, or in common? Separate.
8. How many pupils connected with the school? Thirty-eight attend public school.
9. How many non-resident pupils admitted?
10. Amount paid for tuition by non-residents?
11. Course of instruction?
12. Size of school-room—length, width, and height?
13. Method of ventilation?
14. Number of wards or dormitories? Four dormitories.
15. Size of each—length, width, and height? East 18 x 15½, west 15 x 15½, north 42 x 15½, south 47 x 19½. Height of all 14 feet.
16. Number of beds in each? East 9, west 8, north 19, and south 24.
17. Number of children occupying each ward?
18. Have any of the following diseases occurred during the past year, and if so, how many of each? (a) Scarlatina? None. (b) Measles? None. (c) Whooping-cough? None. (d) Diphtheria? None. (e) Typhoid fever? None. (f) Dysentery? None.
19. How many deaths have occurred? None.
20. From what causes?
21. What is the source of the water supply? Artesian well, with windmill and tank.
22. What is the character of the water? Good.
23. If the source is from a well, at what distance from the latter is the cesspool or privy? One hundred yards.
24. Are water-closets used? One in house, used in sickness and at night.
25. Where are their contents discharged? Into the creek.
26. What system of drainage has been adopted, both for these and other household sewage? An underground sewer, leading to Coyote Creek.
27. Have the discharge pipes, leading from the interior of the house to cesspools, drains, or sewers, been properly *trapped*? They have.
28. Has any provision been made for their ventilation? Yes.

MRS. EMMA J. WISWELL, Matron.

OFFICE OF THE STATE BOARD OF HEALTH, SACRAMENTO, CAL., June 30, 1884.

To Superintendent of Santa Cruz Female Orphan Asylum:

The undersigned having been assigned by the State Board of Health the duty of making a report upon the condition of the public institutions of the State, including the asylums for orphans and half orphans, submits the following questions for your consideration, to which he respectfully asks the favor of an early reply. Any other facts or suggestions not necessarily elicited by the questions propounded, which you consider of interest in their relation to the institution under your charge, will be acceptable to the committee.

Very truly yours,

J. M. BRICELAND, M.D,
Chairman Committee on Public Institutions, etc.

1. Name and location? Santa Cruz Female Orphan Asylum, Santa Cruz.
2. By what religious denomination conducted? Roman Catholic.
3. Present number of inmates? (a) Boys? None. (b) Girls? Seventy-six.
4. Number of *whole* orphans? Ten.
5. Number of *half* orphans? Twenty-seven.
6. Between what ages are children admitted? All ages.
7. Are the playgrounds separate for boys and girls, or in common?
8. How many pupils connected with the school? One hundred and fifty.
9. How many non-resident pupils admitted? Seventy-four.
10. Amount paid for tuition by non-residents? One hundred and fifty dollars a term.
11. Course of instruction? Regular English course, vocal and instrumental music.
12. Size of school-room—length, width, and height? Various sizes—all large.
13. Method of ventilation? Well ventilated.
14. Number of wards or dormitories? Three.
15. Size of each—length, width, and height? Sixty by thirty-four by thirteen; the other, fifty-eight by thirty-eight by twelve.
16. Number of beds in each? Thirty-five in one, and thirty in the other.
17. Number of children occupying each ward? Were all occupied last term.
18. Have any of the following diseases occurred during the past year, and if so, how many of each? (a) Scarlatina? Not any. (b) Measles? Not any. (c) Whooping-cough? Not any. d) Diphtheria? Not any. (e) Typhoid fever? Not any. (f) Dysentery? Not any.
19. How many deaths have occurred? One.

20. From what causes? Consumption. She was dying when she came. We only had her a week.
21. What is the source of the water supply? City water.
22. What is the character of the water?
23. If the source is from a well, at what distance from the latter is the cesspool or privy?
24. Are water-closets used? Privies.
25. Where are the contents discharged? Have them cleaned occasionally.
26. What system of drainage has been adopted, both for these and other household sewage? From kitchen and wash-house to the common sewer.
27. Have the discharge pipes leading from the interior of the house to cesspools, drains, or sewers, been properly *trapped?*
28. Has any provision been made for their ventilation? Yes.

SISTER ROSE GENEVIEVE, Superintendent.

OFFICE OF THE STATE BOARD OF HEALTH, SACRAMENTO, CAL., June 30, 1884.

To Superintendent St. Joseph's Infants' Orphan Asylum:

The undersigned having been assigned by the State Board of Health the duty of making a report upon the condition of the public institutions of the State, including the asylums for orphans and half-orphans, submits the following questions for your consideration, to which he respectfully asks the favor of an early reply. Any other facts or suggestions, not necessarily elicited by the questions propounded, which you consider of interest in their relation to the institution under your charge, will be acceptable to the committee.

Very truly yours,

J. M. BRICELAND, M. D.,
Chairman Committee on Public Institutions, etc.

1. Name and location? Saint John's Institution, San Juan South, California.
2. By what religious denomination conducted? Roman Catholic.
3. Present number of inmates? (a) Boys? None. (b) Girls? Fifty-three.
4. Number of *whole* orphans? Three.
5. Number of *half* orphans? Fifty.
6. Between what ages are children admitted? From four to fourteen.
7. Are the playgrounds separate for boys and girls, or in common? Yes.
8. How many pupils connected with the school? Seventy-three.
9. How many non-resident pupils admitted? Twenty-three.
10. Amount paid for tuition by non-residents? Eighty dollars.
11. Course of instruction? English and Spanish languages and music.
12. Size of school-room—length, width, and height? Thirty-nine feet long, thirty-one feet wide, thirteen feet high.
13. Method of ventilation? Six windows, five vents above.
14. Number of wards or dormitories? Twelve dormitories.
15. Size of each—length, width, and height? No. 1, fifty feet long, thirty-one feet wide, thirteen feet high; No. 2, nine feet high, sixty-nine feet long, twenty-five feet wide.
16. Number of beds in each? No. 1, forty-two; No. 2, seventeen beds.
17. Number of children occupying each ward? No. 1, forty-one children; No. 2, fifteen children.
18. Have any of the following diseases occurred during the past year, and if so, how many of each? (a) Scarlatina? None. (b) Measles? None. (c) Whooping-cough? None. (d) Diphtheria? None. (e) Typhoid fever? None. (f) Dysentery? None.
19. How many deaths have occurred? None.
20. From what causes?
21. What is the source of the water supply? From the well, windmill and horse-power.
22. What is the character of the water? Good and pure.
23. If the source is from a well, at what distance from the latter is the cesspool or privy? Far off.
24. Are water-closets used? Yes.
25. Where are their contents discharged? In the creek or rivulet.
26. What system of drainage has been adopted, both for these and other household sewage? A hole dug in the ground, pipes, etc.
27. Have the discharge pipes leading from the interior of the house to cesspools, drains, or sewers, been properly *trapped?* Yes.
28. Has any provision been made for their ventilation? Yes.

SISTER CARMEN ARGELAGA, Superintendent.

OFFICE OF THE STATE BOARD OF HEALTH, SACRAMENTO, CAL., June 30, 1884.

To Superintendent of Almshouse Orphan Asylum:

The undersigned having been assigned by the State Board of Health the duty of making a report upon the condition of the public institutions of the State, including the asylums for orphans and half orphans, submits the following questions for your consideration, to which he respectfully asks the favor of an early reply. Any other facts or suggestions not necessarily elicited by the questions propounded, which you consider of interest in their relation to the institution under your charge, will be acceptable to the committee.

Very truly yours,

J. M. BRICELAND, M.D.,
Chairman Committee on Public Institutions, etc.

1. Name and location? City and County Almshouse of San Francisco.
2. By what religious denomination conducted? Non-sectarian.
3. Present number of inmates? Thirty-six. (a) Boys? Twenty-four. (b) Girls? Twelve.
4. Number of *whole* orphans? One.
5. Number of *half* orphans? Fourteen. The balance are abandoned children.
6. Between what ages are children admitted? No particular age; some born in the house.
7. Are the playgrounds separate for boys and girls, or in common? Separate as far as practicable.
8. How many pupils connected with the school? Twenty-four attend the public school in the immediate neighborhood; all of school age.
9. How many non-resident pupils admitted? None.
10. Amount paid for tuition by non-residents? Nothing.
11. Course of instruction? General public school course.
12. Size of school room—length, width, and height?
13. Method of ventilation?
14. Number of wards or dormitories? For children two; one for boys and one for girls.
15. Size of each—length, width, and height? Boys', 32 x 13 x 10; girls', 21 x 14 x 19.
16. Number of beds in each? Boys' room, 18; girls' room, 8.
17. Number of children occupying each ward? Boys' room, 17; girls' room, 7; other children with their mothers.
18. Have any of the following diseases occurred during the past year, and if so, how many of each? (a) Scarlatina? None. (b) Measles? None. (c) Whooping-cough? None. (d) Diphtheria? None. (e) Typhoid fever? None. (f) Dysentery? None.
19. How many deaths have occurred? None among the children.
20. From what causes?
21. What is the source of the water supply? Spring water from the surrounding hills.
22. What is the character of the water? First-class.
23. If the source is from a well, at what distance from the latter is the cesspool or privy? The source of supply is a third of a mile from the house, and forced there by a steam engine.
24. Are water-closets used? Yes, on every floor of the building.
25. Where are their contents discharged? Into a capacious sewer, and conveyed beyond the premises.
26. What system of drainage has been adopted, both for these and other household sewage? The pipes all empty into above sewer, which is thoroughly flushed with fire hose every week.
27. Have the discharge pipes leading from the interior of the house to cesspoole, drains, or sewers, been properly *trapped?* The pipes in the building are all properly trapped.
28. Has any provision been made for their ventilation?

M. J. KEATING, Superintendent.

STATE BOARDS OF HEALTH AND THE MEDICAL PROFESSION.

[*Reprint from the proceedings of the State Medical Society.*]

By F. W. Hatch., M.D.

Mr. President, and Members of the Society: Among the radical advances which have been brought about in public sentiment during the past twenty years, as well in theory as in the practical results arising therefrom, none have been more clearly pronounced, or have taken a firmer hold upon the community, than that witnessed in the gradual but widespread recognition of the utility of measures for the prevention of disease. This has not been confined to any one class of society or any single profession. It pervades all classes; it has interwoven itself in the popular mind as a settled conviction. It has become ingrafted in the current literature of the day, and has come to be regarded as an interesting problem in popular science.

That many of the diseases which afflict mankind are preventable, is a maxim as old as Hippocrates himself, and understood by every physician since his day. It is a truth, the natural and irresistible result of the study of disease and its causes. But, although the intelligent and conscientious physician has probably always, on all proper occasions in the course of his professional intercourse with those intrusted to his care, given due warning and instruction as to the principles by which disease may be avoided, it is nevertheless true that his office has been to deal rather with the cure than the prevention of sickness. It is only within comparatively recent years that these two offices have been assigned their true relation, and the medical adviser of a family has come to recognize not only the duty of prescribing the appropriate remedy for present disease, but that the highest achievements of medical skill are to be attained by the discovery of the causes by which disease may be induced and its ravages avoided. In the interest of this important subject the literature of the profession is being enriched day by day. The researches of Pasteur, of Koch, Klein, and others have thrown a flood of light upon the etiological history of many diseases, opening up a field of labor in which the proudest triumphs of medical science are to be accomplished.

It is not the purpose of this report, however, to enter upon a review of the laborious investigations by which the germ theory of disease has been sought to be established, or to speculate upon its ultimate influence upon the prevention and prophylactic treatment of disease. It is alluded to rather with the view of illustrating the general tendency of medical study—that active spirit of inquiry which seeks to search out the causes of the so called infectious diseases, with reference more to their prevention than their cure. Godspeed the day when the vail which has so long obscured this subject may be lifted, and it shall be the glory of the medical profession to do for yellow

fever, cholera, and other epidemic diseases—and, may I not also add, of tuberculosis—that which Jenner, a century ago, achieved for varioloid!

The tendency of the age towards investigation into the preventable causes of disease is yet further shown by the numerous publications which have recently appeared upon the various subjects embraced in sanitary studies. Some of these are designed for medical instruction and to awaken an interest among the profession in matters which, it is assumed, with doubtless much truth, have too little occupied professional attention, but many of them for popular reading, to spread among the people a general knowledge of the common causes of disease and the means by which they may be avoided, to point out to them the various insanitary conditions so universally prevalent, the methods by which they may be corrected, and the danger attending their neglect. I believe that much real good has resulted from these publications; that a spirit of inquiry has been aroused; that conviction has taken the place of doubt in the minds of many who were disposed to cavil at sanitary rules and restrictions, and that a more ready acquiescence is generally manifested than formerly in the regulations adopted for the hygienic improvement of our cities.

The establishment of Boards of Health has been one of the fruits of this increasing intelligence among the people, the best possible evidence of popular appreciation of the important purposes they are designed to fulfill; and these, in turn, by intelligent and well-directed efforts to improve the sanitary condition of towns and cities, and by other practical demonstrations of their utility, have served to keep alive in the public mind a recognition of the truth, that to preserve health the causes of disease are to be avoided.

The first noteworthy step in this direction, one which marked the commencement of a new era in sanitary work, was the creation by the Legislature of Massachusetts of a State Board of Health, in 1869. This was, in fact, the "first permanent body" in the United States, "appointed by State authority for the purpose of investigating the causes of disease, and for warning the people in relation thereto." It was accomplished by coöperation between the laity and the profession, but mainly by the energetic action of the former; "for," as stated by Dr. Bowditch, "the laity, through its legislative and executive officials, vastly more than the profession in its limited sphere of action, must sustain all efforts for the thorough and systematic study of the causes of disease."

An example having so much to commend it to the judgment of all reflecting citizens, in and without the profession, could not long fail to have its influence upon the conduct of other States. In the following year, 1870, a response was heard from the District of Columbia, through the action of the National Congress; one year later, 1871, California and Virginia fell into line; and since then, under the stimulus of a healthy public sentiment, thirty-four States have been added to the list, making a total of thirty-eight State Governments enlisted, under varying and more or less effective statutes, in the great work of public sanitation—laboring under many obstacles, with small means, and sometines, unhappily, with opposition even from those whose support they had a right to expect, yet with hopeful energy, to perfect and promote the scheme of preventive medicine.

Of the benefits resulting from these organizations it is perhaps too to form a proper estimate. The work of social reform is always

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... report. "In the last thirty years," says [illegible] "the [illegible] of England have increased from five hundred and eighty [illegible] and thirty-eight; the population from [illegible] and, while this fact tended to prevent the [illegible] how much good had been done by the [illegible] ans, or to what extent disease had been averted [illegible] of the whole population has remained stationary." [illegible]

Then, again, we have the opposing influence of [illegible] to maintain the death-rate from certain diseases and to shorten the term of human life. Is it too much to believe that State preventive medicine will eventually triumph even over this?

Yet, notwithstanding these circumstances, which, with others, render it difficult to put a true value upon sanitary work, especially in

the United States, it is impossible to believe that great and substantial benefits have not already resulted.

One of the most important offices of the State Board of Health is to disseminate information among the people. This has been liberally done by tracts upon various subjects, widely distributed—tracts upon the prevention and hygienic management of contagious and infectious diseases, such as scarlet fever, measles, smallpox, cholera, and diphtheria; the management of infants; the resuscitation of the drowned, etc. Believing that very many of the diseases which occur are due to prevalent insanitary conditions, to defective drainage and sewerage, to crowded and unventilated tenement houses, to uncleanliness in cities, and even at our very doors, and to the common factors of polluted air, soil, and water, a warning voice has been lifted up, now radiating from the capitals of thirty-eight States, depicting their evils, and teaching how they may be avoided. It is impossible that works of this character should not have produced good results, which, though now inappreciable in their effect upon large masses of population, will ultimately be demonstrated by the admitted diminution of human suffering, and the prolongation of the term of human life.

We may form some conception of what may in time be expected from the efforts alluded to, from what may be shown to have been effected in England.

A century ago, the death-rate of London was eighty per 1,000 of its population; now it is *twenty-three* per 1,000, and by some, set down at only twenty per 1,000. Dr. Buchanan has shown that the mean death-rate in twelve towns in England was reduced from an average of 25.6 per 1,000 for many years before the introduction and enforcement of stringent sanitary measures, such as drainage and sewerage, to 21.7 per 1,000 after their introduction, and that the diminution of the mortality by typhoid fever alone was not less than 47.6 per cent. An equally gratifying reduction was effected in the death-rate of consumption.

Commenting upon these records, Mr. John Simon remarks that they "serve to confute persons who despaired, or affected to despair, of any great preventability of disease; but still more to justify in the public eye, and to encourage in some of the noblest of human labors, those who for many long years have been spending their powers in this endeavor, and to whom it will be the best of rewards to see demonstrations of the good they have wrought."—*Buck's Hygiene.*

The Registrar-General of England, in his last annual report—1881—adds testimony to this effect: "There is nothing in the series of annual reports issued by this office that comes out more distinctly and unmistakably than the wonderful effects which the sanitary operations of the last decade have had in saving life. The death-rate for this year, in England, was 18.9 per 1,000 living. The death-rate in the urban population, consisting of some fifteen and a half million persons, was 20.3, while that of the rural population, comprising some ten and a half million of persons, was 16.8. Comparing the years 1862–71 with those of 1872–81, the deaths in the latter were so much less in proportion that 392,749 persons who, under the old regime, would have died, were as a matter of fact, still living at the close of 1881. Add to these saved lives the avoidance of at least four times as many attacks of non-fatal illness, and we have the total results as yet received from sanitary expenditure." The Registrar

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Of the part performed by the State Board [illegible]

The future will determine. [illegible] however faithful and active the Board may be, it will fall far short of its most important and useful purposes unless [illegible] the co-operation of the medical profession is sought.

This co-operation is needed

First—In the establishment and maintenance [illegible] Health. It requires no argument to show that no [illegible] sanitary work can be performed, no sufficient [illegible] without the aid of local auxiliary boards [illegible] whom the various questions and measures which affect the health interests of communities may be [illegible] direct the methods for the sanitation of towns [illegible] ness, providing for drainage, [illegible] the proper means for the prevention of [illegible] or infectious diseases within their [illegible] may be accomplished, in the most economical [illegible] judicious action, by organized effort [illegible] contagious disease in every community [illegible] well knows. The bulletins of the State Board of Health for the past four years and the published literature of the profession afford many striking examples.

There is probably no city or town of which it can be said that no sanitary supervision is needed, or where cleanliness and other hygienic conditions are unexceptionable. Go into the alleys of even our best cities, and the rear yards of some of their most conspicuous and elegant residences, and the careful observer will frequently discover much needed work for the officer of health. The State Board may issue its tracts and distribute them broadcast over the land, but unless its efforts are seconded by local authority, unless attention is directed to the subject by the local profession and enforced by the mystical authority, which the medical adviser of a family may always wield, they will, as a rule, avail but little. These tracts may or may not be read; or if read are soon buried in oblivion.

There is no more powerful or efficient stimulus to human action than fear, and though general alarm in the actual or threatened presence of an epidemic is not to be encouraged, but rather to be deprecated, a true appreciation of the importance of rational methods of prevention and a proper apprehension of the danger of neglecting them, are to be promoted. Men will act in self-defense, when no other motive will prompt them. It is the mainspring of sanitary work everywhere, and if, with a reasonable fear of epidemic disease, there could be conveyed an equally reasonable confidence in the preventive measures advised, nothing but good could result.

In the presence of smallpox the community will eagerly resort to vaccination, in the assured belief in its efficacy. If the same community could be impressed with the truth that scarlet fever, against

which no prophylactic has yet been discovered, is for this reason more to be dreaded than smallpox, and yearly claims vastly more victims, possibly they would more generally listen to the advice which preventive medicine gives, and which, rigidly adopted, would be almost equally efficacious—to compel its prompt and certain *isolation*. On the expected approach of an epidemic, an active Board of Health, sustained by the medical profession, can gain the consent of the public to the most extreme measures; purse-strings, usually tightly drawn, will be freely loosened.

Second—The coöperation of the medical profession is needed in obtaining for this State, and making effective, a suitable system of registration of deaths, births, and marriages, as well as for zymotic diseases—in other words, in enabling us to arrive at a knowledge of the vital statistics of California. The law now in force seeking to attain this object is simple and easy of execution, if only it were obeyed by those to whom duties are assigned under its provisions. It differs from some other registration laws in that the duty of furnishing the necessary data is imposed upon the Recorders of the several counties, and upon the physicians, midwives, and clergymen or judicial officers who are called upon to attend the sick on the one hand, or officiate in the solemnization of marriages, on the other. That it has been inoperative is due to the fact that it has been generally disregarded by each and all of the parties required to give the needed information. The Recorders, with a few exceptions, have failed to distribute the blanks supplied them, and the physicians and others have failed, it is complained by those county officers who have shown a disposition to do their share in the work assigned them, to report the facts. Hence the reports received from the few counties responding, have been too few, and the information they contained too meager to justify the attempt to make them available for statistical purposes.

There are defects in the law. One of these is the obvious impropriety, it seems to me, of requiring physicians to give their services to the State, even for the useful purposes of registration, without some remuneration therefor; and although the amount which could reasonably be expected for each birth or death would be small, or even insignificant in itself, there is a principle at stake which ought to be recognized. The attention of the Legislature has been called to this subject, but, as yet, without avail.

In the absence, then, of registration, and in view of the neglect just now shown of so many towns to establish and maintain a local Board of Health, the State Board has gladly availed itself of the services of volunteers in a number of towns by whom reports of deaths are kindly forwarded. These reports have subserved a practically useful purpose. They have afforded information of the deaths in nearly thirty towns, and in many instances, the prevalent diseases; and if they could be extended to every section of the State, and *regularly* made, they would practically supplement the deficiencies of the registration law, and enable us to make an intelligent sanitary survey of the State—to map out the relation of its several parts to special diseases, and properly estimate the influence of localities. In no other way, under present circumstances, can the effect of our climate be satisfactorily shown.

Reports of this kind, must, however, generally be inferior in some portant respects, to those which a strictly enforced and compre-

hensive registration system would be able to supply. They make no mention of the births and marriages—essential elements in vital statistics; they give only imperfect data respecting the influence of the foreign population upon the death-rate—especially of consumption, though there is here presented an interesting subject for the statistician. In Boston, in 1855, of all the decedents by that disease, over fifty per cent were natives of Ireland; in the City of San Francisco, for the year ending June 30, 1883, of 863 deaths by phthisis, 577 were of foreign birth—more than sixty-six per cent.

The infant mortality of the State, its rate and causes, are also important considerations which can be satisfactorily studied only by a registration system covering the entire State; yet they intimately concern the prosperity of the State—reflecting to a greater or less extent, the sanitary or insanitary influences which prevail. Precise information upon this subject is especially of value in its relation to preventive medicine, for surely a very large proportion of the deaths among infants are from causes admitted to be preventable, due to plain violations of hygienic laws.

The profession can render valuable aid by impressing upon legislators the importance of registration, and urging much needed amendments to the law. But, until this can be accomplished, volunteer reports from all parts of the State will prove an invaluable substitute. They are indispensable in towns having no Boards of Health, or where, these having been established, the clerk neglects his duty under the law.

Gentlemen of the medical profession: will you extend to the State Board of Health this coöperation, by awakening an interest in the subject of sanitation in the towns or districts of whose sanitary interests you are recognized guides and monitors, by urging the creation of local Boards of Health, by impressing upon the legislators from your districts the importance of remodeling the registration law and of other legislation tending to promote the public health, and by voluntary reports of deaths and diseases, at least from zymotic or preventable causes, within your several jurisdictions?

FACTS CONCERNING VACCINATION, AND SANITARY RULES TO BE OBSERVED DURING PREVALENCE OF SMALLPOX.

CIRCULAR OF THE STATE BOARD OF HEALTH.

[Third Edition.]

To the Public:

At a regular meeting of the State Board of Health, held in this city January 16, 1880, the President and Secretary were directed to issue a circular, whenever, in their judgment, the presence of smallpox in the State seemed to demand it, impressing upon citizens the importance of vaccination, and urging its general adoption. Cases of smallpox had then recently occurred in the metropolis of the State, and in or near some other neighboring cities; and, although the disease had nowhere reached the measure of an epidemic, and there was no occasion for immediate alarm, it seemed the part of prudence to take early warning and prepare for its possible more general prevalence. The constant communication going on between the City of San Francisco and the interior of the State, favored at least a liability that the citizens of the latter might contract disease and convey it to their homes.

The circular issued at that time is applicable to the present. It read as follows:

It has been recognized as a part of the history of smallpox that it occurs at certain intervals, at periods not absolutely accurate or well defined, indeed, but sufficiently distinct to attract attention. It is probable that this periodicity is due to changes taking place in the population more than to any inherent law of the disease. During the prevalence of an epidemic of smallpox, almost every one, under the influence of fear or by force of municipal law, is sooner or later subjected to vaccination, and upon many of those previously vaccinated, the operation is repeated. Only the unprotected are attacked, and the epidemic dies out at length for want of fuel. A period of rest ensues, during which a certain proportion of adults who have been vaccinated in youth acquire renewed susceptibility, and others have been gradually but continuously added to the population by birth or immigration who have never had the disease nor been vaccinated. The fertility of the soil is renewed, ready for the reception and propagation of the germs whenever accidentally introduced.

We, in California, have passed through one of these periods of rest. Numbers have been added to the population of both city and country, and inasmuch as where there is no cause for alarm the duty of vaccination is likely to be postponed, many of these are now unprotected; new material available for the disease has sprung up.

While, therefore, the necessity of vaccination with those who have never been subjected to this safe and simple expedient is, in times of threatened danger, specially urgent, this necessity does not apply solely to them. It is a conceded fact in the history of vaccination that, in very many cases, the immunity it affords is only limited, or for a time. Perfect while it lasts—as perfect, it is believed, as a previous attack of smallpox itself—the duration of the insusceptibility varies with different individuals. Though in some instances it is unquestionably permanent through life, it is safe to say that re-vaccination should always be tried after the expiration of eight or ten years, or, otherwise, whenever during the prevalence of smallpox it is desirable to be assured of protection. By the observance of this rule, and the general adoption of primary vaccination in youth, it is equally safe to say that one of the most loathsome diseases which afflict mankind may be effectually robbed of its terrors.

In thus urgently recommending a general resort to vaccination as a means of protection against smallpox, the State Board of Health cannot too strongly deprecate the careless and [illegible]entific manner in which it is often performed and its results determined. In very many [illegible]ch vaccinations serve only to deceive through a false sense of security.

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dient affords. It should be remembered that even the mildest case of varioloid is capable, equally with the most severe one of genuine smallpox, of communicating the worst form of the disease.

Attention is called to the following sanitary rules to be observed during the prevalence of smallpox:

PRECAUTIONS AGAINST THE SPREADING OF SMALLPOX.

1. *Perfect isolation of the sick.* In cities, or where a suitable hospital has been provided, this is best secured by removal of the sick. In country districts, the end may be attained by allowing only nurses and attendants to visit the sick-room, and these to see no other persons during the continuance of their services as such, without having changed their clothes or subjecting them to thorough disinfection.

2. All persons exposed to the contagion should be *immediately re-vaccinated, even though the experiment may have been unsuccessfully tried only a short time previously.* Possibly, the vaccination may have been imperfect, or the virus inert.

3. After recovery from smallpox, the patient should not be permitted to go out, or to communicate with other persons, until the crusts have fallen off, and his clothing has been renewed or disinfected.

4. After death from smallpox, the beds and bed-clothes, carpets, curtains, and other articles in the room, should be destroyed, or disinfected by the method to be hereafter directed.

Inasmuch as the bodies of those dead by smallpox are still infectious, they should be disinfected, and public funerals should be avoided.

5. *Cleanliness in and about the dwelling,* and ventilation of the latter, afford efficient aids towards the success of other measures to prevent the spread of this and other contagious diseases.

RULES FOR DISINFECTION.*

The distinction between DISINFECTANTS and DEODORIZERS should be borne in mind. The former neutralize the germs of contagious or infectious diseases; the latter remove or destroy smells, or substitute one odor for another, and may or may not *disinfect.* The former are therefore to be preferred.

The DISINFECTANTS proper to be used vary with the object to be attained, or the articles to be disinfected.

DISINFECTION OF THE ARTICLES ABOUT THE PATIENT.

Disinfect the sheets, towels, handkerchiefs, blankets, and other articles used about the patient, as soon as removed, by immersing them in a vessel or tub containing half a pound of sulphate of zinc (white vitriol), or half an ounce of chloride of zinc, or four ounces of the sulphate of zinc combined with two ounces of common salt to each gallon of boiling water. Boil for half an hour. The articles should be placed in the solution before being removed from the room. The discharges from the patient should be received in a vessel containing one of the above solutions, or a solution of half a pound of sulphate of iron (copperas) in one quart of water. The bodies of the

*The rules for disinfection are substantially those recommended by the NATIONAL BOARD OF HEALTH.

dead may be disinfected by washing them with the solution of zinc and salt of double strength, and wrapping them in a sheet saturated with the same solution, or the zinc and carbolic acid solution mentioned above. It is advised, also, to sprinkle the floor with a solution of carbolic acid (one ounce) and sulphate of zinc (six ounces) to one gallon of water. Neither the sulphate of zinc solutions nor that of the chloride of zinc will stain or injure ordinary articles of clothing. These, may, therefore, be used for

THE DISINFECTION OF THE CLOTHING.

Clothing which will not admit of being boiled, and which is too valuable to destroy, may be sprinkled with one of the last named solutions, or the latter may be applied by means of a sponge, the articles themselves being subsequently exposed to the open air.

Other clothing, as silks, furs, woolen goods, and the like, to which the above means are not applicable, should be suspended in the room during its disinfection by the method immediately to be explained, and afterwards exposed to the open air. Furniture, pillows, mattresses, window curtains, and carpets, should at the same time be exposed to the process. It is advised that the carpets should be fumigated on the floor, and the mattresses ripped open for more thorough exposure.

DISINFECTION OF THE HOUSE OR INFECTED ROOM.

For this purpose, sulphur is used. The rule is to take roll sulphur broken into small pieces, place it on a metallic dish resting upon bricks set in a tub containing water, or upon other supports laid across the tub, pour a little alcohol upon the sulphur, and ignite it. Then immediately leave the room. Let the door and windows be tightly closed, and kept so for half a day. Then ventilate the apartment for several hours. One pound of sulphur is advised for one thousand feet of cubic air space. The furniture and paint about the room may be subsequently washed and the walls whitened.

Other substances have been advised as disinfectants for the various purposes above alluded to, but those mentioned are cheap, effective, and within reach of all.

H. GIBBONS, SR., M.D.,
President State Board of Health.

F. W. HATCH, M.D.,
Secretary State Board of Health.

SACRAMENTO, CAL., October 24, 1881.

CIRCULAR ON DIPHTHERIA.

INFORMATION FOR THE PUBLIC.

By the statute organizing the State Board of Health, it is made its duty to take "cognizance of the interests of health and life among the citizens generally. They must make sanitary investigations and inquiries respecting the causes of disease, especially epidemics, the source of mortality, and the effects of localities * * * on the public health, and gather such information in respect to these matters as they may deem proper for diffusion among the people."

By virtue of this authority, and in fulfillment of the duty imposed upon it, and in view of the fact of the prevalence of DIPHTHERIA in some localities, the State Board of Health issues this circular.

It is known that erroneous views are entertained by many regarding this fatal and now common disease—its etiology or causation, its contagious or infectious character, its relation to filth and insanitary conditions.

There is no fact in medicine now more generally recognized by sanitarians than that of the contagious and infectious nature of diphtheria. However much observers may differ as to the local or constitutional origin of the disease, the fact of its communicability from the sick to the well, is almost universally admitted by authorities. Yet, in regard of other points in its history—whether necessarily dependent or not upon a specific germ; whether generated by unhealthy and unclean conditions, by sewer gas, by emanations from privies, cesspools, and other deposits of filth undergoing putrefaction, opinions are not so fully accordant. There is an admitted obscurity as to the true relation of some of these circumstances to the disease.

All are agreed, however, that diphtheria, like other zymotic diseases, is not the necessary lot of humanity; that it is *preventable;* that its ravages are due, in very large measure, to neglect; to the violation, in one way or another, of sanitary laws, and that, though it may not be *generated* by filth, it finds there a soil favorable to its development; that it grows and flourishes there, and that the human system is rendered by it especially sensitive to morbific influences of every kind. A susceptibility to disease, and to the contagious principle by which it is propagated, is thus induced, and hence the liability of its dissemination among the members of a family, or others more remotely and indirectly exposed, is greatly increased. It is better, therefore, to avoid whatever may tend to depress the energies and lower the vital resistance to disease. This, it is certain, filth, uncleanliness in and around the dwelling, does.

Though there is much in common among the contagious diseases as to the method of their propagation by contagion, there are differences peculiar to each which it is important to bear in mind.

In smallpox, the special seat of activity of the CONTAGIUM—"its breeding-places," to use a common term—is in the skin and its erup-

tion and the contents of the vesicles, and in the secretions from the mouth and throat; in scarlet fever, in the skin, even to the termination of the desquamative or *peeling* process, and in the secretions; in measles, in the skin, and the discharges from the mouth, nose, and air passages, and probably in the tears; in diphtheria, in the throat, nose, or other seat of the exudation or membranous deposit.

These may be considered the special seats or *vehicles* of contagion, while in all these diseases, with varying degrees of certainty, communication may be established through the breath, the perspiration, the discharges from the mouth and throat, by articles of clothing, or other substances with which the various secretions and exhalations of the body may, either through the atmosphere, or more directly, have come in contact. There is also reason to believe that the contagium of diphtheria is conveyed by the evacuations from the bowels of those sick with the disease, and by *water* or *milk* contaminated therewith. The disease seems also to be capable of being conveyed by means of the domestic animals, as dogs and cats, which have frequented the apartments of the sick.

From a consideration of these general facts pertaining to the causation of diphtheria, may be deducted rules for its *hygienic management*, and its *prevention*.

ITS HYGIENIC MANAGEMENT.

The disease having been introduced into a family, the fact of its CONTAGIOUSNESS should be promptly recognized, and suitable precautions taken.

(*a*) By strict *isolation* of the sick. Shut off all communication with the house, especially by children, and admit to the apartment only those absolutely required as nurses. Though children are very much more liable to the disease than adults, and commonly have it in a more severe form, the latter do have it, and, besides, by visiting the sick, expose themselves to the risk of conveying the contagion to others. Visits of sympathy, therefore, however benevolent and commendable their motives, should be avoided.

(*b*) Other members of the family—children under fifteen years of age more urgently, for reasons just stated—should be removed, if possible, to a part of the house having no direct communication with the apartment occupied by the sick person. If the latter is in the upper stories of the house, probably the rooms on lower floors may be safely used.

(*c*) The room occupied by the sick should be large, exposed where practicable to the sunlight, and capable of being well ventilated. It should be remembered in this connection that by *good ventilation* is understood an *abundance of fresh air without a draught*. All useless furniture—curtains, carpets, and the like—should be removed. A disinfectant solution should be kept in the room in an uncovered vessel, in which infected clothing suitable for washing, soiled shirts, pillow-cases, blankets, etc., should be soaked before removal from the apartment. They should then be boiled. The same disinfectant solution, being stainless, may be sprinkled over the bedding and carpets, when the latter have not been removed, or it may be occasionally diffused through the room by an ordinary spray instrument, thus reaching and destroying infectious particles in the atmosphere.

A solution recommended for the above purposes may be cheaply made by dissolving eight ounces of sulphate of zinc (white vitriol) and four ounces of common salt in a gallon of water. It is better than carbolic acid, and has the additional advantage of being odorless. For convenience the ingredients may be mixed by using *four* tablespoonfuls of the zinc, *two* of salt, and one gallon of water.

(*d*) All discharges from the bowels and kidneys of the patient should be immediately disinfected by pouring over them, liberally, the disinfectant just mentioned, or by a solution of sulphate of iron (copperas, or green vitriol), made by dissolving about one and one half pounds of the salt in a gallon of water. They should then be removed and, preferably, buried.

The secretions of the nose and throat should be received upon rags, and these burned.

(*e*) The attendants upon the sick should not communicate nor associate with other members of the family, or with the public, without having first changed their clothes, and washed and disinfected themselves. The zinc solution may be advantageously used for this purpose; or thymol (a substance obtained from the common thyme and some other plants), prepared by dissolving one half ounce (four teaspoonfuls approximately) of thymol in two ounces of alcohol, and adding a tablespoonful of this to one half gallon of water. It is believed to be a valuable disinfectant, equal to and less disagreeable than carbolic acid. This solution may also be used as a spray about the room.

(*f*) Death occurring, the body should be thoroughly washed with the zinc solution, and then wrapped in a sheet wet by soaking in the same. It should then be placed in a tight coffin. The funeral should be private. The body clothes worn by the deceased should be burned, or effectually treated with the zinc solution as above advised.

(*g*) In case of recovery of the patient, he should still be kept apart from others—especially children—until all his clothing has been completely disinfected with the boiling zinc solution. He should be provided with uninfected clothing, and should not be allowed to attend school, or other assemblages, until in the judgment of a competent medical authority it is safe so to do. The tenacity of the contagious principle in diphtheria is admitted to be very great, and the period of time after recovery from the disease when the danger of its communication to others may be considered past is as yet uncertain. There is good evidence that the disease has been conveyed by infected clothing several weeks, and even months, after having been worn.

(*h*) The room occupied by the sick should, after the recovery of the latter, be vacated and completely disinfected. This is best done by the fumes of sulphur. As already mentioned, articles too valuable to be burned, such as linens, flannels, blankets, etc., may be treated with the boiling zinc solution.

Other heavy articles, as woolen clothing, pillows, furs, and the like, which cannot be boiled, should be suspended and exposed in the room to be disinfected, and, after the completion of this process, hung in the open air. Mattresses and upholstered articles should be ripped open, for better exposure to the fumes of the disinfecting agent. Carpets may be left on the floor, but afterwards taken to the open air and beaten.

In using sulphur, the rooms to be fumigated must be vacated. Place the sulphur in iron pans, supported upon bricks set in a tub containing a little water, and ignite it by the aid of a spoonful or two of

been conveyed by such an one by kissing, or by drinking from the same cup. As scarlet fever may occur without the *rash*, so may there be diphtheria without the characteristic membrane upon the throat.

6. Avoid the *ordinary* causes of disease—imprudence in living, exposure, unsuitable or insufficient clothing, and whatever can tend to lower the vital resistance to epidemic influence. Sound health is one of the best preservatives against infectious diseases.

By the State Board of Health.

F. W. HATCH, M.D.,
Permanent Secretary.

SACRAMENTO, CAL., May 29, 1883.

CIRCULAR FROM THE STATE BOARD OF HEALTH

To the Boards of Trustees and Local Boards of Health of Incorporated Cities and Towns, with Extracts from the Political Code.

To the honorable Board of Trustees or Council of ——:

GENTLEMEN: On a previous occasion a communication was addressed to your honorable Board from the State Board of Health, calling attention to the provisions of Section 3061, of Article V, Chapter II, of the Political Code of the State of California, requiring the establishment of a Board of Health in "every incorporated town and city in the State." To what extent this law has been observed is not clearly known by the State Board of Health, inasmuch as, except in a few instances, no information has been received by the latter of the action taken by the Board of Trustees of the several cities and towns. The State Board of Health desire to obtain this information, and at the same time to direct your attention to certain reasons why the observance of the law is considered urgently important.

The statute providing for the organization of the State Board of Health makes it one of their duties to "place themselves in communication with the local Boards of Health throughout the State." This the State Board are desirous of doing, to the end that, as an "Advisory Board," they may be able to render any assistance or give advice in emergencies liable to arise in any locality, and at the same time may themselves be kept regularly informed of matters relating to the sanitary condition of different sections of the State. The relation thus established between the State Board of Health and the local Boards is an important one, involving mutual responsibilities, and imposing reciprocal duties. To the discharge of the obligations resting upon the former, the failure of the latter to convey the necessary information of their organization in so many instances, and the neglect of the Boards of Trustees of some of the cities and towns to establish any local Health Board, have proved serious obstacles. Wherever the fact of the creation of a local Board has been made known, the State Board have endeavored to "place themselves in communication" therewith, by the distribution of tracts and circulars upon sanitary subjects, and by personally, through one or more of its members, visiting localities threatened or invaded by epidemic disease. These are regarded by them as among their most important duties, and only by their faithful discharge can their organization be made effective for the greatest good. Yet, in the absence of any information touching the sanitary condition of localities, how can the full measure of their responsibilities be fulfilled?

The necessity of maintaining a Board of Health in every city and town is often too lightly regarded by the public. At a time when general health prevails in a community, the thoughts of men are not commonly turned towards preparation for disease. "Sufficient unto the day is the evil thereof"—a doctrine which, however wise it may

be in some of the affairs of life, has often been productive of the most lamentable consequences. When the enemy is at the gate there is little time for measures of defense; when epidemic disease appears snatching our loved ones from the family circle, and spreading dismay over hearts unused to fear, is an inauspicious time for preparation to expel the destroyer. What is done in a hurry is seldom well done. Better far to maintain the proper organization at all times, and to seek to remove, in anticipation, the causes more or less prevalent in every community, which invite disease. This it is made the duty of a local Board of Health to do: To "supervise all matters pertaining to the sanitary condition of their town or city, and to make such rules and regulations relative thereto as are necessary and proper, and not contrary to law."

The clause of the law just above quoted is comprehensive, and was designed to cover every possible emergency which might arise in any locality. It embraces measures of general sanitation, the cleaning of foul places, the removal of nuisances, the regulation of sewers, drains, vaults, and cesspools, and the adoption of means to prevent the spread of contagious disease by isolation, disinfection, or otherwise, as the wisdom of the Board may determine. And to provide for extreme necessity, it further empowers the Trustees to adopt any portion of Articles III and IV of the same chapter, embracing the more comprehensive health laws of San Francisco and Sacramento. Among these may be found the following provisions:

SEC. 3025. No person shall deposit in any cemetery, or inter in this city * * * any human body without first having obtained, and filed with the Health Officer, a certificate signed by a physician or midwife, or a Coroner, setting forth as near as possible, the name, age, color, sex, place of birth, occupation, date, locality, and the cause of death of deceased, and obtain from such Health Officer a permit. * * * Physicians, when deaths occur in their practice, must give the certificate herein mentioned.

Again:

SEC. 3034. Every physician in the city * * * shall report to the Health Officer, in writing, every patient he shall have laboring under Asiatic cholera, varioloid, diphtheria, or scarlatina, immediately thereafter, and report to the same officer every case of death from such diseases, immediately after it shall have occurred.

SEC. 3045. The Board of Health may locate and establish pest houses, and cause to be removed thereto, and kept, any person having a contagious or infectious disease; may discontinue the same, and make such rules and regulations regarding the conduct of the same as are needful.

These are a few of the rules which may be adopted by Boards of Trustees for the guidance of Boards of Health. Their importance in the interest of the public health will be self-evident.

The statute requiring the formation of Boards of Health in incorporated cities and towns, makes it the further duty of each Board to "report to the Secretary of the State Board of Health, at Sacramento, at such times as the State Board of Health may require:

"*a.* The sanitary condition of their locality.

"*b.* The number of deaths, with the causes of each, as near as can be ascertained, within their jurisdiction, during the preceding month.

"*c.* The presence of epidemic or other dangerous, contagious, or infectious disease, and such other matters within their knowledge or jurisdiction as the State Board may require."

Whenever the State Board of Health has been informed of the ganization of a local Health Board in any town or city, the Secre- y has invited and solicited reports covering the subjects just cited,

blank forms for returns of deaths and for reports of [illegible] cases, embracing mainly such as are [illegible] form, and are commonly considered [illegible] and sent. The responses to these [illegible] that the State Board of Health [illegible] obtain the information required, [illegible] bers of the medical profession in a [illegible] erously volunteered their services for the purpose. The returns thus received are valuable monthly [illegible] of the State, but embrace only a [illegible] should be greatly multiplied, and this can in no way be [illegible] accomplished as through local Health Boards [illegible] tained upon an active working basis in every [illegible] city in the State. Without the aid of the [illegible] mation can seldom be obtained by the State Board of [illegible] of "epidemics or other dangerous contagious or infectious diseases" as called for by subdivision "c" of the law as above cited. Such reports upon this subject may, under ordinary circumstances, prove sufficient, but the diseases embraced under this [illegible] in their localization in a community they are [illegible] when least expected, and may call for prompt and energetic measures of protection.

In all such cases, not only should the Local Health Board be provided with the facilities for an early knowledge of the fact, but the State Board should be at once informed, in order that it may render such assistance and advice as the occasion may require.

That epidemics may be averted by the adoption and enforcement of timely and judicious measures of prevention, it would not be difficult to demonstrate. Their germs cannot live and bear fruit in an inhospitable soil. As wheat perishes from drought, so the living principle by which epidemic disease is propagated often dies out when deprived of the nourishment afforded by insanitary conditions. But the latter are essentially under the control of human agency. A single case of smallpox introduced into a community, left to itself, will multiply indefinitely among the unprotected, but the timely application of vaccination will confine it to its original limits - strangle it in the home of its birth. The same may be assumed, and abundant evidence has demonstrated the fact, of other similar diseases, as scarlatina and diphtheria, by isolation and disinfection. Hence the importance of an active Board of Health, to which the occurrence of the first case may be communicated, and under whose authority vigorous measures of prevention may be pursued. Such measures should never be left to irresponsible individual application. They should be systematically and intelligently conducted by the Board of Health, or, by their authority, through their executive (the Health Officer), responsible to the appointing power for faithful service. It cannot be too strongly or too frequently repeated that success in any effort to repress epidemics of contagious or infectious disease will depend upon the promptness with which the first cases are reported and restrictive action commenced, and the intelligence and efficiency with which preventive measures are applied.

To this end the Health Officer should be an educated physician, interested in sanitary matters, and well informed in sanitary methods. There is work enough in any community to occupy a wide-awake and appreciative Health Officer for a considerable portion of his time.

The great mass of the public are negligent of sanitary concerns. Filth accumulates in public and private places, privies and cesspools become foul and offensive, drains choked up, leaking, or otherwise defective; wells are thoughtlessly located so as to receive by percolation the contents of privy pits and vaults; the soil itself becomes polluted by steady and uninterrupted accessions from these and other sources, and, in turn, pollutes the air which rises therefrom into the dwellings of the people; all these are recognized causes of disease, and constitute subjects to which the attention of the sanitarian may be profitably directed. Thus, to a great extent, the amount of preventable sickness prevailing in a community becomes, under ordinary circumstances, the measure of the interest taken in local sanitation.

But in addition to these general duties, the law requires the Health Officer, or the Board of Health represented by him, to make reports to the State Board of Health, as already explained, at such times as the latter may direct, of deaths and of contagious or infectious diseases occurring within his jurisdiction.

For these services the Health Officer should be paid. For their efficient performance a certain amount of preparation is needed—a certain fitness usually represented by the educated and experienced physician; nor can they be suitably done without the expenditure of a certain amount of time, which, to the medical man, is more or less valuable. The public have no right to accept these services without at least a reasonable compensation, and, according to this, they should expect faithful and punctual discharge of the duties required. It is quite possible that the failure on the part of the local authorities to appreciate the extent and importance of the work, and to designate a small but fair compensation therefor—a compensation commensurate with the population and resources of the town—has been the main cause of the frequency with which the provisions of the statute have been disregarded.

Money thus expended is not lost. Even, as an investment, it cannot be regarded unprofitable, for if, as it has been estimated, for every death there are at least twenty-five cases of sickness, and if to the money value of a human adult life there be added the cost of sickness, it requires no extraordinary degree of sagacity to estimate the saving capable of being effected by the reduction of the death and sickness rates by judicious sanitary observances. That such is the result to be reasonably expected from a strict compliance with hygienic rules, the history of the world, and especially of recent times, conclusively shows.

The law under consideration was not designed to apply to cities and towns whose health ordinances had been already established by law. Such is the case with several incorporations by whose charter the Board of Trustees themselves were constituted a Board of Health. Yet even in such cases, the importance of a Health Officer to give special attention to matters affecting the public health is equally urgent. There need, therefore, be no conflict between the chartered authority of cities and the statute. Both aim at the same general result, and this result will depend upon the interest and zeal manifested in the work, and upon the liberality by which it is sustained and encouraged.

In thus presenting the subject to your consideration, the State Board of Health are actuated by a desire to awaken such an interest throughout the State as may lead to practical benefit, and to

enlist the coöperation of the Boards of Health of every incorporated city or town in what it believes to be one of the most important duties imposed upon them in their official capacity.

In promoting an object so essential to the general welfare, the State Board will hold themselves in readiness to render any assistance in their power. In this respect California is far behind her sister States. Shall it longer be said of her that she remains inappreciative of what, in the judgment of the most enlightened people, affects the highest interests of States?

With this circular a series of questions will be received, which the State Board of Health will feel under obligations to the clerk of the Board, or the Health Officer, if there be one, to answer and forward to the Secretary, at Sacramento, as soon as convenient. It is important that the facts embraced therein should be fully known in order that the State Board of Health may:

First—Place themselves in communication with all established health organizations, as they are required to do by law;

Second—That they may be able the better to appreciate the conditions locally existing throughout the State having any bearing upon health; and

Third—That, by the mutual interchange of thought and effort between the State and local Boards, a greater interest may be awakened, and a more cordial coöperation secured.

Respectfully submitted for the State Board of Health.

F. W. HATCH, M.D.,
Permanent Secretary.

SACRAMENTO, January 21, 1884.

EXTRACTS FROM THE POLITICAL CODE OF CALIFORNIA, RELATING TO BOARDS OF HEALTH.

[Amendment to Section 3061, approved March 19, 1878.]

Board of Health to be established in incorporated towns and cities.—Duty of Board.—Trustees may adopt Articles III and IV.

SEC. 3061. It shall be the duty of the Board of Trustees, Council, or other corresponding Board, of every incorporated town and city of this State, to establish, by ordinance, a Board of Health for such town or city, to consist of five persons, one at least of whom shall be a practicing physician and a graduate of some reputable school of medicine, and one, if practicable, a civil engineer. The members of the Board shall hold their offices at the pleasure of the appointing power. Every local Board of Health established in this State must:

First—Supervise all matters pertaining to the sanitary condition of their town or city, and make such rules and regulations relative thereto as are necessary and proper, and not contrary to law.

Second—Report to the Secretary of the State Board of Health, at Sacramento, at such times as the State Board of Health may require:

a. The sanitary condition of their locality.

b. The number of deaths, with the cause of each, as near as can be ascertained, within their jurisdiction, during the preceding month.

c. The presence of epidemic or other dangerous, contagious, or infectious disease, and such other matters, within their knowledge or jurisdiction, as the State Board may require.

The Trustees, Council, or other legislative Board, by whatever name known, of any incorporated city or town of this State may, by ordinance, adopt any portion of Articles III and IV of this chapter, or either of them, for some definite period of time, as may seem proper for the regulation of sanitary matters within their town or city.

SEC. 2. This Act shall not extend to any incorporated city or town, or city and co which health regulations are provided by special statutes

May appoint Health Officer in lieu of Board.

SEC. 3062. In the place of appointing a Board of Health, the Board of Supervisors, or the city or town authorities, may appoint a Health Officer, with all the duties and powers of the Board of Health and Health Officer, as specified in the two preceding articles.

Per capita or property tax, how levied.

SEC. 3063. All necessary expenses of enforcing this article are charges against the counties, cities, or towns respectively, for the payment of which the county, city, or town may levy a per capita tax of not exceeding three dollars, or a property tax of not exceeding one fourth of one per cent yearly, until the same is paid.

REPORT OF H. Y. BALDWIN,

QUARANTINE OFFICER AT YUMA.

The following report from Dr. H. Y. Baldwin was received too late for insertion in its proper place, and is therefore given here.

YUMA, ARIZONA TERRITORY, October 31, 1884.

The Secretary of the California State Board of Health, Sacramento, California:

DEAR SIR: In forwarding my last account for the season to the State Board of Health at Sacramento, I am desirous of making a few remarks. In the first place, I believe the reason of the dispute as to whether there is yellow fever or not in Sonora, arises from the fact that there is a malarial fever there, called, by the Mexicans, "tonto fever," and which prevails wherever yellow fever presents itself. Tonto fever is not contagious, nor so fatal as yellow fever, but in other respects is very similar, and I expect that many medical men often do not recognize the distinction between a mild case of genuine yellow fever and a case of tonto fever. I have seen, since I came here, several convalescents from both yellow fever and tonto fever. The recovery from tonto fever is more rapid as compared to the recovery from yellow fever; and I have no doubt, in my own mind, that the two diseases exist in Mexico.

Secondly, I would again draw the attention of the Board to the fact that Yuma is no place for a quarantine station during the Summer; the temperature is too high, and also, I believe there would be great trouble with the citizens of Yuma if any yellow fever cases were detained on this side of the Colorado River.

I would *strongly* recommend the Board, if they should see fit to appoint a quarantine next season, to remove the station to San Gorgonia. There is no population there to speak of; it is the highest available point on the road between here and Los Angeles, and within easy reach of supplies, were any needed.

In my opinion, the quarantine here during the past Summer did great good, indirectly, by preventing people leaving Sonora. I know of several cases, or rather have heard of them through the railroad men, of people who, had there been no quarantine here, would have immediately started for California on the outbreak of yellow fever at Hermosillo, but did not do so on account of the fear of being detained on their way if they were taken ill. As regards the actual number of people who have passed through from Sonora to California, I unfortunately kept no record, but every train for about two months had one or more Sonora passengers, and sometimes as many as fifteen and twenty. I have to thank the railroad officials for their kindness to me in making my work as light as possible. Mr. Muir, the manager of the road at Tucson, was particularly kind in always telegraphing the number of Mexican passengers I had to look out for at

night, and keeping me posted as to the result of the examination at Nogales.

Lastly, with all due respect to the Board, I would draw their attention to the fact that the salary they have been paying the last Quarantine Officer is inadequate to supply even the common necessaries of modern civilized life in this place, and the inspection of trains (if this last Summer is to be taken as a criterion) leaves the unfortunate Quarantine Officer no time for private practice of any kind, without speaking of sleeping.

I have the honor to be, sir, your obedient servant,

H. Y. BALDWIN, M.D.,
Quarantine Officer at Yuma.

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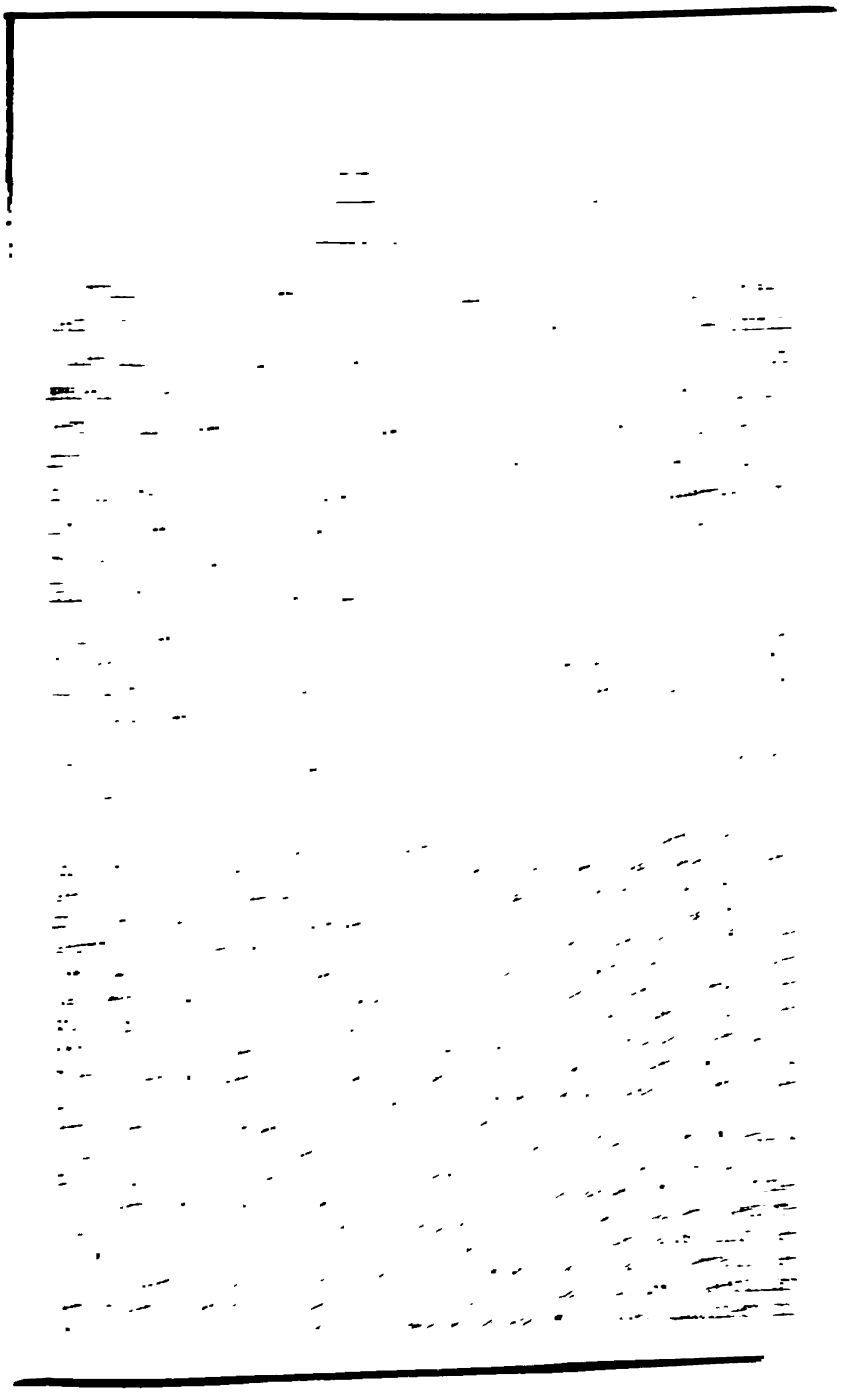

which he has performed his stewardship, so shall his reward be in this life as well as in that which is to come. The ambitious tell us how their fathers have died upon the tented battlefields; they paint how they sank beneath the tide of victory, and the billows of honor and glory which encircle the brow of the hero of war are written in poesy and song. But what, to us, are the tints of mourning renown which are so soon mellowed by the pencil of time, when compared with the loss of our friend and our brother? Ours is the profession of humanity; the profession which in all ages and in all climes makes countless thousands daily rejoice; and surely, when he who was the exemplification of this humanity has been gathered in, ripe in years and in honors, it is for us to cherish his memory and to briefly record the richness of the harvest of his days.

He was born in Charlottsville, Virginia, March 2, 1822. His boyhood days were passed in Washington, D. C., where his father, an Episcopal clergyman, was Chaplain of the United States Senate for twelve years. But little is known of this period of his life other than that he was of genial disposition, quiet and retiring in his habits, and very studious.

His literary and classical education were obtained at Union College, Schenectady, New York. Here, we learn, he evinced such an aptitude for the acquisition of his education, and applied himself with such assiduity, especially in his classical studies, that he ranked amongst the first in a large class, and was graduated M.A., with honors, at the early age of nineteen.

Having determined to study medicine, he at once repaired to the metropolis of the nation, where the largest opportunities were presented for the furtherance of his purpose, and entered the medical department of the New York University. Here his youthful mind fed upon the teachings of a Mott, a Draper, a Revere, a Post, a Payne, and a Bedford, fit educators of a noble and worthy pupil, and he was graduated M.D. March 10, 1844. While acquiring this part of his education, he has often told me with pride and in reverence that the hopes which had been already warmed in his youthful heart first budded and blossomed, and here did the honey form in the fair expanding bud, whose fragrance this society has had the good fortune to inhale.

He was married to Sarah R. Bloom, in Charleston, South Carolina, June 12, 1844, and located almost immediately afterwards for the practice of medicine in Beloit, Wisconsin. He afterwards moved to Southport (now known as Kenosha), Wisconsin, where he soon acquired an extensive and lucrative practice, and was regarded as being one of the most competent and reliable physicians. But his great humanity, which was one of his distinguishing characteristics, prevented his accumulating much of this world's goods. Besides, being

[illegible]

Dr. Hatch had lived.

But it was not alone in the [illegible] qualifications were exemplified, [illegible] varied as the occasion, and a [illegible] his every vocation. He was an active member of the [illegible] Board of Health for more than twenty years, was [illegible] dent for several years, and its efficient president until after the death of Dr. Logan, eight years ago.

For several years he was Professor of the Theory and Practice of Medicine in the Medical Department of the University of California, and for the past four years was Professor of Hygiene in the same institution. He was likewise a

member of the American Medical Association, and contributed many valuable papers, mainly upon hygiene and kindred subjects, which are liberally interspersed throughout its published transactions for the past twenty-five years.

He was also an active member of the American Public Health Association, and regretted exceedingly that his feeble health prevented his attending its late meeting in St. Louis, at which, it is observed, he was appointed a member of the Advisory Council on the seventeenth instant.

To all who knew Dr. Hatch intimately, it is mere superfluity to proclaim his virtues, for his whole life was one of goodness and active benevolence; but to those who were less fortunate in the enjoyment of a familiar acquaintance, and who, because of his retiring disposition, might regard him as being cold and unsympathetic, it may be said no more unjust estimate could be formed of any man, for he was naturally quiet and unostentatious, but was warm-hearted, kind, generous, sympathetic, hospitable, and entertaining to a degree seldom met with. In his relations with his professional brethren he was always kind, courteous, and dignified, recognizing all regular physicians as his peers, and never at any time or under any circumstances taking advantage of his own attainments to their detriment. In this respect his utter unselfishness was truly phenomenal. Therefore it was that all of us, however young or however old, however limited our opportunities and acquirements, or however proficient, ever delighted to solicit his assistance in intricate cases, or have him share responsibility with us in consultation. It can be truthfully said of him that no medical man ever felt that any undue advantage had ever been taken of him by Dr. Hatch, for he knew not how, because he was so naturally honorable that no one ever thought it was possible for him to be otherwise. In his afflictions he never murmured, but submitted with Christian faith to the approach of death, for "he wore the white flowers of a blameless life."

But while he filled honorably and with marked distinction his every position in life, it was in the family circle that he always appeared in the full measure of his greatness and worth, and it was there, too, that he found true happiness and comfort. As a man and friend, he was honest and true; as a citizen and member of our profession, he was useful and valuable; but as a husband and father, he rose to the full stature of human perfection. He was at all times a hard worker and diligent student, and, being of but medium physical development, he was less capable of enduring bodily ailments when thus afflicted than many others of even less strength.

About eight years before the onset of his last illness he was attacked with double pneumonia, which came well nigh taking his life, but from which he slowly and gradually recovered. It was not, however, until about two years ago

that his friends regarded him as being fully recovered, and even then it was observed by those who were the most conversant with his real condition that he had never regained his normal health. The infirmities of age were becoming prematurely developed. His step was less elastic, his ability to attend to his professional duties was becoming gradually enfeebled, and mournful whispers were not infrequently heard that ere long his familiar form would be missed from our streets. The cough which persisted ever since his attack of pneumonia in was feared betokened pulmonary trouble of a serious nature. It was not, however, until his return from Washington, whither he had gone to attend the meeting of the American Medical Association, as well as that of the Public Health Association, in May last, that serious apprehensions were entertained that his days of usefulness were nearly over. A severe cold which he had contracted on his journey to Washington was much aggravated by cold and inclement weather in New York and subsequently in Wisconsin. On his return, late in May, it was observed that he was much fatigued, in fact, exhausted, and although he visited his office once or twice after his return, it was evident to all that he was seriously ill. Hopes were nevertheless entertained that rest and entire freedom from labor would restore his health for a season at least. Examination of his lungs disclosed the existence of considerable solidification in the upper portion of each, and it became evident that he was slowly succumbing to fibroid phthisis.

Yet, in this enfeebled condition, he prepared and sent to the hands of the State Printer his biennial report as Secretary of the State Board of Health, which, although plainly manifesting the imperfections incident to his illness, will, nevertheless, be read with much interest, for it is his posthumous contribution to sanitary science, and bears evidence of his great usefulness and wonderful capacity for the work intrusted to his hands.

On the thirteenth instant, when it was believed that his condition had slightly improved, his kidneys, which had previously performed their function normally, ceased to secrete, and symptoms of uræmia soon developed, which gradually increased until he died on the sixteenth, at seven o'clock in the evening.

But it was as a member of this society that his great loss will be most keenly and deeply felt by us, his fellows and co-laborers. He was our first President, a position to which he was unanimously reëlected for five successive terms, and until he unqualifiedly declined to longer serve, because, as stated by himself, "the mantle of our choice should now surely be placed upon another." Those of us who are here to-night, and were then present, recollect the reluctance with which we yielded to his earnest but pronounced desires. Of the regularity of his attendance at our meetings, his readiness

to entertain the society when it came his turn, the interest manifested by him at our meetings, his ability in the discussion of all subjects introduced, the wrapt attention bestowed upon his every remark, the completeness and beauty of his diction, and, above all, the grand success which attended our efforts during his incumbency of office, I forbear to speak at length—it was truly phenomenal, for then membership in the Sacramento Society for Medical Improvement was regarded, not only by ourselves but throughout the whole State, as a synonym of professional standing nowhere else to be obtained in California. His contributions were at all times of a high order, and would reflect credit upon any like organization, wherever situated; indeed, if collected and published in conjunction with a few of his other papers that are scattered promiscuously throughout the journals, they would form "an enduring monument to a splendid career," for they are the golden fruitage of a well-spent life.

His earthly labors are ended; the places which once knew him will know him no more forever; yet "he is not dead, but liveth;" a radiant light, the white-winged messenger of hope, now crowns his brow, and a sheen of gold is reflected from his path. Then:

> As in life he was calm, let his grave be apart
> From the din of disturbance and riot,
> In his brightest days still dear to his heart,
> 'Twas to live in calmness and quiet.

The following resolutions were then adopted and ordered on the minutes:

WHEREAS, It hath pleased an all-wise and inscrutable Providence to remove from this life our friend and fellow-laborer, Dr. F. W. Hatch, who for thirty-three years had been one of the most zealous, skillful, and conscientious practitioners of medicine known to us, and an active and prominent charter member of this society; therefore,

Resolved, That in the death of Dr. Hatch this society recognizes the loss of one who at all times exercised his great influence with marked effect for its good and the promotion of its usefulness.

Resolved, That we will ever cherish in grateful remembrance his forbearance towards his fellow-members, his earnestness in promoting and maintaining harmony, and his earnest appeals for the strictest justice, tempered with charity.

Resolved, That in commemoration of his memory this preamble and these resolutions be spread upon the records of the society, and published in the Pacific Medical and Surgical Journal and Western Lancet, and an engrossed copy be transmitted to the widow of the deceased.

W. R. CLUNESS,
IRA E. OATMAN,
G. L. SIMMONS.

IN MEMORIAM.

In accordance with a resolution passed at a meeting of the California State Board of Health, held November 22, 1884, and in conscious acknowledgment of their inability to do justice to their subject, your committee, appointed for the purpose, have prepared and beg to submit the following brief and inadequate memorial of the life and some of the services of our late venerable and esteemed President, Henry Gibbons, Sr.:

Dr. Henry Gibbons, Sr., was born in Wilmington, Delaware, September 20, 1808. His father, Dr. William Gibbons, was a physician in Wilmington, distinguished in his profession and an earnest laborer in the field of science. Dr. Henry Gibbons graduated in medicine in the University of Pennsylvania in the year 1829, and immediately thereafter opened an office for the practice of his profession in his native town. His great attainments and the remarkable suavity of his manners were soon appreciated by a discerning public and speedily brought him into a large and lucrative practice.

His broad and inquiring mind was not to be satisfied by eminence in the profession which he had chosen, but in the collateral sciences sought scope for the development of further usefulness; in the furtherance of this design, he originated and published, with distinguished success, a scientific journal devoted to the interest and welfare of the community in which he lived. At this time he became a most ardent and consistent advocate of the cause of temperance, a course which he pursued with unabated vigor to the last moment of his life. His fearless and uncompromising hostility to the use of alcoholic stimulants, except under the permission and direct supervision of a medical adviser, caused him to be considered by many as extreme in his views, and engendered in less able minds a feeling of animosity which could only be allayed by a more intimate knowledge of the man. But to any one who knew Dr. Henry Gibbons, and felt the earnest sincerity, and were conversant with the high philanthropic design which actuated his motives in advancing the great cause which he advocated, knew that love for the we

fare of his fellow-man was alone the mainspring of his action in this as in the many other benevolent enterprises in which he passed his life.

About the year 1844, Dr. Gibbons left Wilmington and settled in Philadelphia, where he remained for six years in successful practice; at the end of this period, influenced by the wider field and golden promises offered by the new El Dorado, California, he turned his steps westward, and reached San Francisco in 1850, where he resided during a long and useful life. In that young city his distinguished attainments had already preceded him, and at once he took a commanding position both professionally and socially. He became one of the founders of the Medical College of the Pacific, in which he filled, with great success, the Chair of Practical and Clinical Medicine, and so continued during his life. He also established and conducted with marked ability the Pacific Medical and Surgical Journal, through the pages of which he was not only able to disseminate his own views in his own original and inimitable manner, but also afforded a medium through which the medical men of the Pacific Coast were enabled to demonstrate to our Eastern brethren the progress of medicine, and the many peculiarities of this climate in its effects upon diseased conditions. Dr. Gibbons was a member of the American Medical Association, an ex-President of the Medical Society of the State of California, of the San Francisco County Medical Society, California Academy of Sciences, and other kindred and scientific societies. He was also one of the most earnest advocates for the establishment of State Boards of Health, and in conjunction with the late Dr. T. M. Logan, had a bill passed by the Legislature in 1870 establishing the California Board of Health, was unanimously elected its President, and remained in that honored position until the day of his death. It is in his relation with this Board that your committee desire to express their sense of the calamity that has befallen the cause of sanitary science in the demise of Dr. Henry Gibbons. Possessed of a most retentive memory, a clear analytical mind, a discriminating judgment, a fluent and impressive address, and a most facile and attractive writer, he brought all of his great mental powers to bear upon the subject of sanitary science.

The successive biennial reports of the proceedings of the Board which have from time to time been published bear evidence of the untiring industry of the man. No service was too onerous for him if by it he could lighten the burdens of suffering humanity; no subject was deemed by him too trivial if in it he saw a possible benefit for his fellow-man. His life was one grand exposition of love and tenderness toward mankind; his very bitterness, when moved by anger unjustly excited, was turned to sweetest joy when the offending object tendered the olive-branch of peace; he

could not harbor resentment, and his kindly, generous nature was never more strongly shown than when he had to reprove an erring brother.

It is no disparagement to the profession of this State to say that it had no more ardent student, no more loyal, devoted, or zealous defender, no more conscientious practitioner or faithful counselor; none more ready to make sacrifices to convictions of right and duty in aid of honest, legitimate, and scientific medicine, than Dr. Henry Gibbons. He was a true friend, a generous enemy, an honest man, and when the Recording Angel places his name in the Book of Life he will not fail to add:

He did unto others as he would that they should do unto him.

GERRARD G. TYRRELL, Chairman.
W. R. CLUNESS.
H. C. CROWDER.

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